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ACTIVITY IN MUNICIPAL IMPROVEMENTS

We have the anomaly of plenty of money and rather high interest rates, the reasons for which are numerous and complicated. Foreign demand for capital is one, but the money is not yet going abroad as rapidly as it is coming here and probably will not until the war is over. The presidential campaign is on and produces a reducing effect upon the rate of construction, which thus far is not as pronounced as usual. Prospects for plenty of work are therefore certain, tho the fashion of the last two years continues and decisions are not made far in advance of beginning construction.

The municipal field is the most promising and the amount of work in public improvements, always slow in starting, promises to break all records. Municipal bonds, especially of the serial form, are the most popular investment and the sales for the first five months of 1916 break the record of municipal bond sales in the same period for all years except 1914. Activity was particularly great late in the month, promising further advance in municipal investments as the year goes by. Presidential elections do not have a retarding effect upon municipal expenditures, but rather the contrary.

Predictions for last year were so well borne out that MUNICIPAL ENGINEERING again predicts almost a record-breaking year in the construction of municipal improvements. Contractors and dealers in materials and machinery will do well to concentrate upon this field this year.

ENGINEERING ADVICE

A committee of the Iowa State Engineering Society very much fears that the engineering periodicals are taking the bread out of their mouths by offers of advice on engineering subjects. It quotes from letters, circulars and advertisements of various publications in support of its claims but gives no examples of such robberies.

The need of education of communities on engineering matters is so great and the recognition of the need is so slight that the periodicals have been trying to fill it to the extent of their opportunities and have supplemented as well as they could the activities of the State in this direction. And, conscious of the fact that they are aiding the engineering profession and are not taking work away from individual engineers they will continue what they consider to be a valuable contribution to the advancement of the nation and the better recognition of the engineering profession.

Education of public officials to an appreciation of the need of engineering talent in designing and supervising the construction of their public works is a very different thing from doing the actual work. The engineer in practice is obliged to do much of it for which he never gets any compensation, and he should be thankful to have it done at no expense to him, even if it is done as extensively as is stated below. The writer has had experience in all lines of this educational work and can assure the committee that, so far as the technical journals go, it never goes beyond the educational stage and is always for the benefit of the practicing engineer and never to his detriment.

A quotation from an article by G. R. Bascom in one of the offending periodicals will show what the University of Wisconsin is doing in this line, and will show that such institutions are going farther than the periodicals would dream of going, even if their equipment and business methods would permit, tho they commend such efforts when properly limited as proposed:

The general scope of this engineering service is in the form of advice to communities and individuals. The service is intended to be limited to the field covered by the usual "preliminary survey" as furnished by experts in advising generally upon engineering subjects. Finished plans and specifications will not be submitted. If necessary the department will send a competent engineer to investigate and make a report on the problem at hand. These services are free except in cases when an engineer must make trips to study the conditions; in such cases the community is expected to reimburse the department for the traveling expenses of the engineer. The plan may be further explained, if desired, in an address by the engineer to the taxpayers of the village. Here the work of the Extension Division ends. If the village officials decide to go ahead with the plan, a consulting engineer in private practice is employed by them to work out detailed plans and specifications and supervise the construction. It can thus be seen that in this service we are advising, guiding, and inspiring rather than serving in an engineering capacity in its fullest sense. We believe that we are filling a real need, for the work has thus far clearly demonstrated the fact that communities will take the impartial advice of the university departments where the overtures made by individuals in the promotion of public improvements might be viewed with suspicion.

CENTRAL STATION STEAM HEATING

BY MILES CITY, MONTANA, MUNICIPAL PLANT

By G. C. Pruett, City Engineer.

Steam heating as a by-product of a municipal light and power plant is not so common but that a description of this successful plant will be of interest. The principles and data upon which the design was based are given in some detail and also details of construction so that the article will be of value to many whether city officials or connected with private light and power plants.

MILES CITY acquired its light and power plant in 1892 by purchasing the holdings of the Miles City Light & Water Co., a corporation holding a twenty-year franchise, but which at that time was involved in a receivership.

After making some slight changes and additions, the city struggled along with this dilapidated and antiquated plant until 1900, when a number of other changes and additions were made, which placed the plant in a fairly good condition so far as economical operation was concerned, but it could not be classed as a model plant by any means. It was, however, the most which could be done at that time with the finances available.

Between 1900 and 1910 other changes and additions were made to the boiler and generating plant, leaving a plant at the beginning of 1910 consisting of one 150-h.p. slow speed Corliss engine, one 150-h.p. Chuse high speed engine, three 150-h.p. return tubular boilers, two 120-kv.a. single-phase alternators, and a Brush arc machine with a capacity for 100 lamps.

Two more 150-h.p. return tubular boilers and a stack 6x100 feet were added to the boiler equipment in 1910, and a 300-h.p. high speed Corliss engine connected to a 250-kv.a. 3-phase alternator was added to the generating equipment. The two 120-kv.a. generators were changed to 3-phase machines, and the whole was enclosed in a new building.

This gave the city quite a modern plant, and one of sufficient capacity for the time being, but, owing to the rapid increase in the demand for light and power, this plant reached its capacity last winter and steps are now being taken to increase the boiler equipment with a 300-h.p. Franklin water-tube boiler with stoker equipment, and the generating equipment with a 300-h.p. high speed Corliss engine direct connected to a 250-kv.a. 3-phase alternator. When the installation of this equipment is complete the plant will then have a boiler capacity of 1,050-h.p., an engine capacity of 900-h.p. and an electrical capacity of 770-kv.a.

Owing to the favorable location of the plant to the center of the business district and the unfavorable location for installing condensers, an agitation was started in 1910 for the installation of a district steam heating system in order to make use of the exhaust steam which was going to waste. Lack of finances, however, prevented going ahead with this at that time, and the matter was continued until 1914 when it appeared that a sufficient reserve had been accumulated from the operation of the light plant to permit going ahead with the work.

Contracts for the first section of the heating plant were let in August of that year and completed about the first of October. This section included the laying of a 14-inch line from the light plant to Main street and all the valves and other equipment required to be installed in the light plant for the proper control and regulation of the steam for heating.

Owing to the lateness of the season it was deemed advisable to discontinue the work for the balance of the system until the following year. Contracts were let early in 1915 for the balance of the material to complete the plant. About the time the material began to arrive the city was served with a restraining order on the basis that the statutes for the state of Montana did not specifically state that a municipality could engage in the steam heating business. This came from an offended citizen who was refused a permit to install a competing plant. The case was tried in the district court and resulted in a decision favorable to the enjoiner. On appeal the city won, the supreme court holding in effect that a municipality could engage in any business whether specifically stated in the statutes or not, if by engaging in the business it would result in a benefit to the community. The case was sent back to the district court to determine whether or not such an enterprise would be a benefit to the community. The city won again and the work was started immediately and is now practically completed.

Design—The first matter taken up for consideration in the design of the plant was to make a survey of the entire district proposed to be heated. This was done, and the cubical contents of all the buildings within the district were found to be 5,150,000 cubic feet.

Without going to the refinement of measuring all the openings and exposures for the entire district, the next step was to select a representative half block bordering on the proposed steam main and make complete measurements for this. The following data were obtained:

Cubical contents	515,780 cu. ft.
Exposed wall surface	32,500 sq. ft.
Glass surface	4,100 sq. ft.

In the figures allowance was made for poorly constructed walls and all other items which would add to the heat requirements of the buildings. Doors and other similar openings were figured as glass, and the roofs, where there was an attic space between the ceiling and roof, were figured at 0.5 wall exposure.

The Weather Office records were next consulted, and it was found that the heating season taken from the average of a number of years back would be 230 days, or 5,520 hours. Also that the average temperature for the heating season would be 34.3 degrees F., and the average minimum monthly temperature 19 degrees F.

A number of buildings were next investigated where heat had been installed on the basis of Prof. Carpenter's formula,

$$h = \frac{nC}{55} + \frac{W}{4} + G$$

Where h equals the B.t.u. required per hour per 1-degree difference in temperature between the outside and inside.

C equals the cubical contents of the building to be heated.

n equals the number of air changes in the building per hour.

W equals the exposed wall surface or equivalent.

G equals the exposed glass surface or equivalent.

It was found that where a minimum temperature of —20 degrees F. had been used, this formula had given satisfactory results.

Using this as a basis it was found that 1,000 cubic feet space required 3,927 pounds of steam per season, using the season temperature of 34.3 F., one air change per hour, 70 degrees room temperature, and on the assumption that 1 pound of steam will give up 1,000 B.t.u.

Similarly 100 square feet of wall surface was found to require 4,910 pounds of steam per season, and 100 square feet of glass, 19,640 pounds.

Using the data for the representative half block as given above, it was found that 1.6 pounds of steam per 1,000 cubic feet per hour would be required at the average season temperature, 2.3 pounds for the maximum monthly, i. e., with a difference of 51 degrees, and 4 pounds for the maximum daily with a difference of 90 degrees.

Consequently. 5,150,000 cubic feet would require

$4 \times 5{,}150 = 20{,}600$ pounds of steam per hour as a maximum.

Using the formula $p = .000131\ (1 + \frac{3.6}{d})\ (\frac{w^2 L}{D d^5})$

to obtain the size of pipe and pressure drop, where

p equals drop in the pressure per sq. in.

d equals diameter of pipe.

w equals weight of steam in lbs per minute = 343 lbs.

D equals weight of steam per cu. ft. = 0.0425 lb.

L equals length of pipe in feet, taken as 1,000 ft. in these calculations,

$$p = 0.875 \text{ lb.}$$

This is not an unreasonable rate of drop for the district proposed and, inasmuch as the quantity of steam given in the calculations is the maximum daily average, and would not be required except during very severe weather, it was considered a reasonable allowance.

It will also be noted that the lowest monthly average temperature is only 60 per cent. of that used in the above calculation, and inasmuch as the heat requirements vary directly as the temperature difference, and the pressure drop inversely as the square of the weight delivered, the pressure drop for the average monthly rate was found to be 0.31 pound per square inch.

The greatest distance of distribution from the plant with any future extensions which are now being considered is 3,000 feet, incurring a drop of 1 pound pressure per square inch on the basis of the lowest average monthly temperature, from the plant to the consumers service. With a plant pressure of 3 pounds per square inch this will leave 2 pounds at the consumers' service, a very desirable pressure with a properly installed system. For severe weather this pressure can be boosted up to 5 pounds in order to maintain a constant pressure at the consumers premises.

It is not desirable, however, to use this higher pressure on account of the back pressure put on the engines, but inasmuch as it will not be a frequent occurrence, and only for short periods of time, it is permissible. Furthermore, it is not likely that more than 75 per cent. of the buildings along the main will connect, in which event there is ample capacity to allow for probable future building developments.

The whole system is proportioned as outlined above, i. e., the probable steam consumption is computed for the point under consideration, the drop figured and pipe proportioned as outlined. By this system it is not likely that the mains will be found too small for proper distribution, as is so often the case, unless there should be some abnormal growth at some point which has not been taken into consideration.

The next thing was to find out if the exhaust steam from the light plant was sufficient to supply the demand, and if not, to find out the approximate amount of live steam which would be necessary, and how much the additional cost could be.

Estimates, as outlined, were made of the requirements for each month, using the average monthly temperatures as found in the records of the Weather Office. The following table gives these monthly requirements together with the percentages of the total for the season:

Month	Lbs. of Steam Required	% of Total
September	885,464	2
October	3,099,124	7
November	4,870,054	11
December	8,411,912	19
January	8,411,912	19
February	8,411,912	19
March	6,198,250	14
April	3,099,124	7
May	885,464	2
Total	44,273,216 lbs.	100%

Reference to the records of the light plant showed that only three months, December, January and February approached dangerously near these figures, and that the water evaporated during these months, after allowing for feed-wtaer heat, pipe condensation, and steam for other auxiliaries would slightly exceed the demands.

A detailed examination of the load curves, however, revealed the fact that at certain periods of the day, especially during severe weather, there would be an insufficiency of steam. The remedy for this was to make a rearrangement of the load demand, which was easily done by rearranging the pumping schedule for the water plant, it being electrically operated with power from the light plant. This overcame the difficulty to a certain extent, but not entirely, but will be sufficient for some time from the fact that the total demand will not be thrown on the plant immediately. In the meantime there will probably come other load demands which can be thrown in the valleys and the quantity of exhaust steam built up to the requirements. If such should not be the case it will then be necessary to use some live steam, the maximum which is likely ever to be required being estimated at 10 per cent. for the three months mentioned, i. e., 2,523,736 pounds. This would require 160 tons of coal, if the evaporation rate is taken at 8 pounds of water evaporated per pound of coal, which is not an unreasonable assumption. The average evaporation for the year as taken from the records of the light plant gives approximately 6½ pounds, and as the fires are banked during the period that this excess heat would be required, it would not seem that the rate of 8 pounds per pound of coal was too much.

Construction—The pipe for the distribution system is extra strong w. i., insulated with a double wrapping of asbestos paper which is bound with copper wire. The pipe is encased in tin-lined wood casings having a 4-inch wall. These casings have an inside diameter 2 inches greater than the outside diameter of the pipe. The pipe is held concentrically with the casings by means of cast iron chairs installed one to each length of pipe. These chairs have rolls to allow the pipe to expand and contract without causing an undue strain on the pipe.

Expansion and contraction is taken care of by means of variators installed at proper locations. These variators are generally equipped with openings in the top diameter for the service connections. This furnishes dry steam to the service. All variators and other specials are enclosed in concrete chambers which are filled with sawdust and covered with a 3-inch plank cover which is topped off with 6 inches of concrete.

Valves and traps for collecting and disposing of the main

condensation are located in concrete manholes which are also filled with sawdust and equipped with double packed covers.

The log for the pipe insulation is made with bell and spigot joints. They are driven together to a tight fit and the joints are sealed with asphalt. All places where the coating has been knocked off the logs are also given a good coat of asphalt, and the whole is covered with a layer of tarred felt with lap joints.

Water is kept away from the log by means of a double line of 4-inch open-joint drain-tile laid to proper grade with the top 6 inches below the bottom of the log. This is surrounded and covered with screened gravel, which is carried 6 inches over the top of the log. The tile is connected to the city sewers at proper intervals. The pipe condensation is also piped to the nearest city sewer.

The depth to the top of the log is generally about 4 feet, but this varies with the grade of the street and the obstructions encountered. Generally speaking, however, there has been little trouble from the interference of street obstructions, because of the fact that these are carefully referenced and in making the lay-out for the pipe line these records were carefully consulted.

What has been said with reference to the main lines applies equally to the service pipes, except that logs 2 inches thick are used for insulating them. The city runs the services to the curb and installs the control valve. The services are run at the time the mains are laid.

Costs—The cost of constructing the heating system was $14,000 for the first section, which consisted of 725 feet of 14-inch main from the light plant to the center of Main street at a point which is approximately in the center of distribution, 300 feet of services, and all piping and valves in the light plant for the operation and control of the heating.

The second section, which consists of 1,610 feet of main line, 6, 8 and 10 inches in diameter, and 1,400 feet of services will cost, when fully completed, about $16,000.

In addition to this there will be an expenditure of about $2,000 for meters and other equipment to be used on the consumers premises, bringing the total expenses to approximately $32,000. This is all being paid from an accumulated surplus in the light fund, which is sufficient.

Expected Revenues—It is estimated that the cost for maintenance and operation will not increase the ordinary operating cost of the light plant by more than $2,000 per annum, and that the revenue for the first year will be $6,000. As a matter of fact, those using steam for the past two seasons together with the contracts already signed up will easily exceed this. The estimated revenue for the second year is $10,000 and for the third year $12,000. Succeeding years will probably show a slow increase, but the amount to be expected is hard to estimate.

It is the intention to make a further reduction in light rates as soon as the heating system is firmly established on an operating basis; this on top of a rate which is already as law as any in the state, notwithstanding the fact that the majority of the cities of the state are supplied with electricity from the large hydro-electric plants, speaks well for municipal ownership which is kept out of politics and given a thoroly business administration.

Business Methods and Rates—The business methods and rates adopted for this heating system merit some consideration. Usually the first question asked by a prospective consumer when approached is "How much will it cost?" This question is forestalled, generally, by having measured up the premises and having an estimate of his requirements at hand. These estimates are made such that they are conservative, if reasonable judgment is used in the operation of the plant, and the plant is put in proper condition. He is also advised in what manner he can make improvements to his premises in order to cut down the amount of heat which will be required.

It is generally found that the requirements will not much exceed what he has been used to paying for coal, not to say anything about the expense and annoyance connected with operating the coal plant. I say generally, because there are conditions when the requirements will be vastly different.

The rates as established and which were approved by the Public Service Commision for Montana, are as follows:

1st 10,000 lbs., per month	$0.90 per 1,000 lbs.
2nd 10,000 lbs., per month	.83 per 1,000 lbs.
3rd 10,000 lbs., per month	.76 per 1,000 lbs.
4th 10,000 lbs., per month	.69 per 1,000 lbs.
5th 10,000 lbs., per month	.62 per 1,000 lbs.
Over 50,000 lbs., per month	.55 per 1,000 lbs.
Minimum charge	$5.00 per month

Discount, 20 per cent. on all bills paid on or before the 25th of the month following that in which the service was received.

It is needless to say that economy will be exercised in the use of the steam, as all services now connected are, and those to be connected, will be on meters.

The material for this work was furnished by the American District Steam Heating Co., of North Tonawanda, N. Y., thru their sales agent, the R. B. Whitacre Co., of St. Paul, Minn. The first section was laid by the forces of the American District Steam Heating Co., but the last one is being done with city forces.

Chicago City Manual

Francis A. Eastman, city statistician of Chicago, has completed a bound volume, entitled "Chicago City Manual," covering the municipal statistics of that city for the year ending 1915.

This manual contains very interesting historical chapters as well as statistics relating to the various annexations to the city of Chicago, Chicago Plan Commission, the growth of the leading cities of the world, consuls in Chicago, department operations, Eastland disaster, volunteer fire companies, the great Chicago fire, as well as the origin and growth of the different municipal departments.

This valuable book also goes into detail relative to street railway strikes, Sunday closing orders, vice district, unmarked graves, etc. The manual is by no means a dull book. It has its solid matter and its tables and other things which it is necessary that official publications shall have to be exact and to present figures so they can be compassed quickly, but it also has its stories of fighting fires before even horses were used to haul the engines and when man power was the pumping agency. Statistician Eastman ought to know something about sizable fires, for he was postmaster of Chicago when the city was all but destroyed, in October, 1871. It was to Mr. Eastman that a great number of the official messages of sorrow and of promises of relief were sent in those stricken October days.

The growth of Chicago is followed by Mr. Eastman. He personally has seen much of the progress of the town, for here he has lived for a good many years. He is one of the very young veterans of whom Chicago has so many and is glad that she has them. The annexations of territory which have been made from time to time are given wit hthe date of acquirement and with the measures of the taken territory. It is a useful book, prepared by a man who knew how.

STREET LIGHTING INSTALLATION

IN PORT JERVIS, NEW YORK

By H. A. Tinson and D. M. Diggs.

The following article comprises an interesting and well arranged description of a recent installation of Edison Mazda series lamps for street lighting. Pertinent details of the cost, layout, construction, operation, and appearance of the installation are included. This lighting system in Port Jervis has proved so satisfactory that it will afford a good typical pattern for other towns having similar requirements. It is from the "General Electric Review," to which we are indebted for the illustrations.

SINCE the introduction of the Edison Mazda lamp in high candle-power sizes and more efficient types, there has been created a great amount of interest in regard to street lighting on the part of the layman. In practically all cities and towns there is more or less demand for better street illumination and very many of them have been provided during the past year with new street lamps and equipment. A larger number are either in process of making changes or actively considering the subject.

It is of timely interest, therefore, to record in detail what has just been accomplished in Port Jervis, New York—a city that has made such improvements in a very complete manner.

Port Jervis is a typical city of New York state, of about 10,000 inhabitants, situated far enough away from the metropolis to have ideas and standards of its own. It is a very progressive city in many ways, has well paved brick and macadam streets, and many local manufacturing enterprises. The city government is conducted on the commission plan and the cordial relations and co-operation which existed between the city commissioners, the local lighting company (Port Jervis Light & Power Company) and the manufacturers and installation contractors for the new street lighting equipment, have resulted in the best and most approved units of the correct sizes and types being employed and installed at relatively proper spacings and proper heights.

General Layout—The business district of Port Jervis is more or less divided into two distinct sections. On referring to the plan, Fig. 1, it will be noted that the ornamental system of lighting is installed in what might be termed the "down town" section, with units extending on Pike street to East Main street. Pike street itself for some little distance is residential, but it leads to another business street, where trading is done, so that the ornamental units are installed thruout the part of this street connecting the two trading sections. The fixtures installed in this district comprise ornamental novalux units with 600-c.p. 20-ampere Edison Mazda lamps mounted on ornamental iron standards. (See Fig. 2.)

On Main street a smaller amount of retail business is carried on, but as this street is important as the principal thorofare connecting to Kingston avenue (one of the main roads of travel in and out of town) it is lighted with 400-c-p. Edison Mazda novalux pendant units, suspended on span wires over the center of the street.

The principal main roads leading to the city are Kingston avenue, Jersey avenue and Fowler street, the two latter being

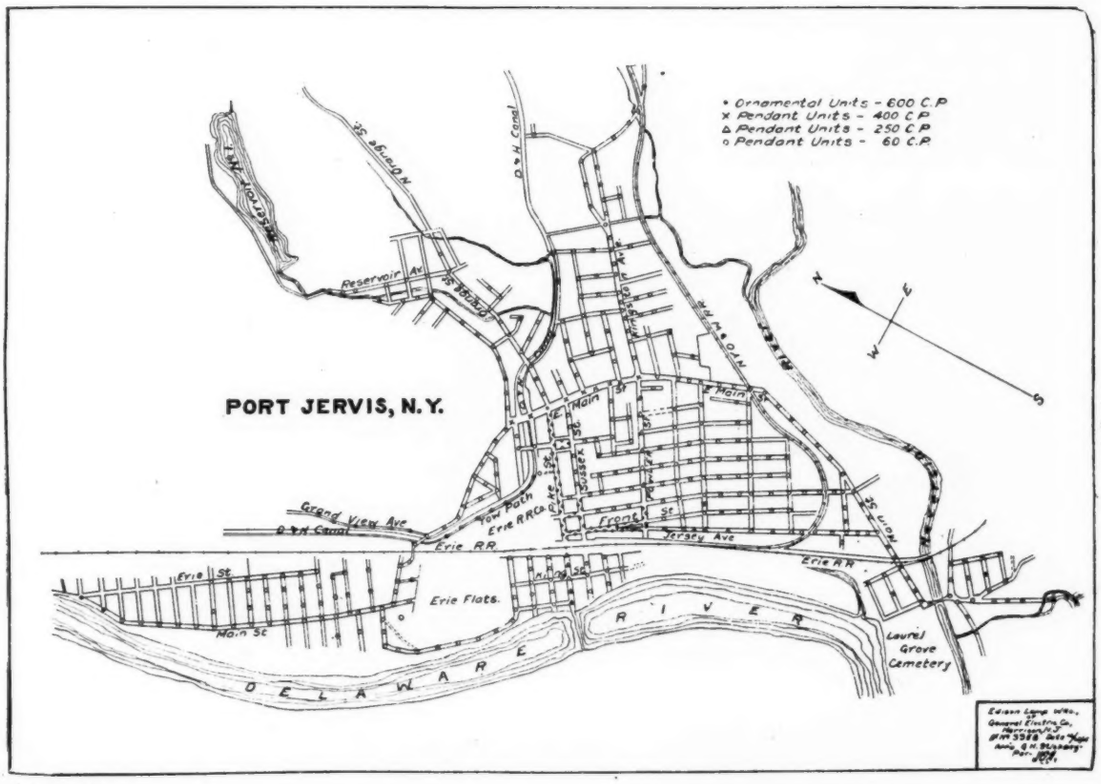


FIG. 1.
MAP OF PORT JERVIS, N. Y., SHOWING THE LAY-OUT OF THE STREET-LIGHTING SYSTEM.

FIG. 2. DAY VIEW IN PORT JERVIS, SHOWING NOVALUX UNITS WITH 600-C.P., 20-AMP. EDISON MAZDA SERIES LAMPS.

lighted by means of 250-c.p. Edison Mazda lamps, on center span suspensions. A typical illustration of this type of unit is shown in Fig. 3.

All other streets in the city are illuminated by 60-c.p. Edison Mazda lamps; some on center span suspensions and some on brackets fastened to the wooden poles.

There are now installed in Port Jervis a total of 460 units, made up as follows:

59 600-c.p. units on ornamental posts.
8 400-c.p. units on span suspensions.
19 250-c.p. units on span suspensions.
374 60-c.p. units on span suspensions and brackets.

Character of Streets—The streets in general are well paved and well kept. In the main business sections the paving is of brick and on the main thorofares macadam. The retail area is typical of a city of this size, the buildings being of brick and of moderate height. In the residential sections of town the houses are mostly of frame construction with grass plots in front. The foliage is dense in many cases and, therefore, the span suspension system adopted is well chosen to meet this condition.

In the down-town section, where the ornamental units are installed, the maximum width between curbs is 44 feet and the minimum 32 feet, with an average of about 37 feet. From building line to building line the width runs from 75 to 55 feet. In the other sections of the city the average width is approximately 50 to 55 feet between building lines. Parts of the city are hilly and, as will be noted from the plan. Fig. 1, the general layout is somewhat irregular, which made it necessary in many instances to vary the spacing of the lighting units.

There are a few points of general interest that might be noted; i. e., at the junction of Jersey avenue and Front street, and the intersection of Pike and East Main streets are located drinking fountains for horses. At both these places ornamental iron posts were mounted on top of the fountains, which illuminate the surrounding spaces at these points. The ornamental posts are located with special reference to the local conditions of traffic, rather than to secure equal spacing. A number of posts of various descriptions were removed from the business section and thus helped to clear the street and make it appear more attractive.

With the exception of the ornamental post installation, all the units are provided with prismatic refractors.

Ornamental Post Units—The ornamental post units comprise a cast-iron pole, finished in bronze, made from a special design by the Mott Iron Works, of New York, and a Novalux unit equipped with an Edison Mazda series lamp of 600-c.p. The lamp is of the 20 ampere type, operated thru an auto-transformer (or compensator) mounted in the casing of the unit. The height to the center of the diffusing globe is 14 feet 6 inches.

The posts are staggered, the spacing on one side varying between 110 and 150 feet, with an average of 130 feet. Each post is provided with an absolute cutout. The posts were made in two pieces and are 12 feet in length from the ground line to the lamp-casing holder. In the base a door 10½ by 20 inches is provided and inside are provided two lugs on which the cut-out is mounted. The posts were especially designed so as to appear slim and ornate, and after they were set they received a second coat of red lead and then two coats of dark Venetian bronze, the high lights being finished in copper bronze. The posts were all mounted in position so that the door faced squarely towards the building line. The concrete foundations are 16 by 18 inches, and not less than 24 inches in depth, depending on the soil conditions.

Underground Construction—The series line is carried overhead to the ornamental system and is then taken underground. A No. 8 B. & S. solid gage armored cable is used, insulated with 30 per cent Para rubber which is secured with overlapping rubber-filled cotton tape of 0.012 inches in thickness, and over this 1/16 inch lead sheath. The cable is then served with a layer of jute yarn asphalted and wrapped with two layers of steel tape. Over this again is laid more jute yarn and it is then thoroly saturated with asphalt compound and coated with soapstone to prevent sticking when reeling or handling. The cable is laid in a trench 12 inches below the surface of the ground immediately behind the curbing, but where it enters the conduit elbows, set in the concrete foundations of the posts, the depth is increased to avoid too short bends. In crossing the intersecting streets the cable is laid in a duct.

FIG. 3. DAY VIEW IN PORT JERVIS, SHOWING AN EYE-SUSPENSION UNIT WITH 20-IN. CONCENTRIC REFLECTOR, PRISMATIC REFRACTOR, AND 250-C.P. EDISON MAZDA SERIES LAMP.

FIG. 4. NIGHT VIEW OF MAIN STREET, SHOWING NOVALUX ORNAMENTAL UNITS EQUIPPED WITH 600-C.P., 20-AMP. EDISON MAZDA SERIES LAMPS.

The total amount of underground cable used approximated 5,000 feet. The leads from the cut-out to the lamp are of No. 8 B. & S. gage stranded wire, being two conductor, 4/32 inches 30 per cent Para rubber covered and double braided; a water loop is made at each cut-out.

The underground system is bonded together with bare copper wire in the base of each post, bonding both the steel armor and the lead sheath; the pole being also properly grounded. The armored conductors, at the points where they are joined to the overhead system, are continued to the pole carrying the overhead system and then run up a 2-inch lateral to a height of 20 feet.

The contractors for the installation of the underground work and the ornamental posts assumed responsibility for one year after completion of the work for any defects occurring in the setting of the posts or settling of the street paving, if the cause should be attributable to work done on the installation of this system.

A typical night view looking towards the junction of Front street and Jersey avenue is shown in Fig. 4. The illumination on the street surface is very uniform and the general appearance of the street after dark is quite attractive. The fronts of all the buildings are illuminated from the ground line to roof and appear to stand out prominently against the dark background of the night.

In Fig. 5 is shown another night view taken on Pike street, looking towards the business section. Here the spacing is somewhat wider, owing to the residential character of the street. The use of medium density glassware has resulted in the elimination of excesive glare without too great an absorption of light.

Pendant Units—For the lighting of a section of East Main street, which, as previously described, is partly a business section, eight novalux pendant units are installed. These are equipped with 20-inch concentric porcelain enameled steel reflectors, prismatic refractors and 400-c-p. 15-ampere Edison Mazda series lamps. These units are installed on span suspensions at a height of 20 feet above the roadway, and spaced approximately 200 feet apart.

For some distance leading from the center of the town, Jersey avenue and Fowler street are lighted with 250-c.p. units similarly suspended and spaced. The unit used comprises a span-suspension fixture equipped with a 20-inch concentric porcelain enameled steel reflector and prismatic refractor. In Fig. 3 is shown a day view of Jersey Avenue with one of these units in the foreground. These lamps are spaced approximately 200 feet apart and placed about 20 feet high. Figs. 6 and 7 depict night views taken with this unit. The former is on Jersey avenue, which is paved with brick, and the latter is a view of Fowler street, which is macadam paved.

It is very interesting to record how even the illumination appears on the street surface with these relatively low power units, and for the size of the unit employed, the illumination is of high intensity. The buildings, even between the units, stand out quite prominently. The lower parts are well illuminated, so that persons can very easily and safely approach their homes after dark. At the height these lamps are placed the cut-off is such that relatively little light is projected towards the upper story of the residences. It is a fact that any person or moving object can be quite readily perceived on any part of these streets for a distance of five or six blocks. To view this installation after dark affords a striking demonstration of the effective application of the prismatic refractor to this class of street lighting.

With the exception of the streets specifically mentioned and described above, all the other streets and thorofares within the city limits are lighted by 60-c.p. Edison Mazda series lamps. The equipment used is similar to that provided for the 250-c.p. lamps, except that 18-inch reflectors and the smaller size of prismatic refractor are used with these smaller lamps.

The spacings average 200 feet and the majority of the units are installed on span suspensions at about 15 feet above the roadway. In some instances, however, brackets are used affixed to the poles, at a height to bring the lamps about 15 feet above the ground. All of these lamps are operated from constant current transformers, which formerly were used to operate a.c. enclosed carbon arc lamps.

The replacing of the lamps and cleaning of the refractors on all the pendant units is accomplished by lowering the units on a cord permanently run to the pole for the purpose.

The entire ornamental installation, including all the necessary equipment and labor was paid for by the city at a cost of about $100 per unit. The construction work was done by the Central Station Equipment Company, of New York. All the pendant type units were provided and installed by the Port Jervis Light & Power Company.

FIG. 5. NIGHT VIEW OF PIKE STREET, SHOWING NOVALUX ORNAMENTAL UNITS EQUIPPED WITH 600-C.P., 20-AMP. EDISON MAZDA SERIES LAMPS.

In concluding this description of the street lighting at Port Jervis, it can be said that the satisfaction and appreciation shown by people of that city over this civic improvement is evident to any visitor. The utilization of street lighting equipment that has been scientifically designed and installed, is an important factor in the case, but co-operation between all the parties concerned has been of equal importance in securing these results in this installation.

FIG. 6. NIGHT VIEW OF JERSEY AVENUE, SHOWING EYE-SUSPENSION UNITS, EQUIPPED WITH 20-IN. CONCENTRIC REFLECTORS, PRISMATIC REFRACTORS AND 250-C.P. EDISON MAZDA SERIES LAMPS.

FIG. 7. NIGHT VIEW OF FOWLER STREET, SHOWING EYE-SUSPENSION UNITS, EQUIPPED WITH 20-IN. CONCENTRIC REFLECTORS, PRISMATIC REFRACTORS, AND 250-C.P. EDISON MAZDA SERIES LAMPS.

British Standard Nomenclature for Tar, Pitch, Bitumen and Asphalt

The eagerly awaited report of the Engineering Standards Committee, dealing with the vexed question of the nomenclature of tars, pitches, bitumens and asphalts, when used for road purposes, was issued May 22, and the definitions recommended should go far towards preventing the misunderstandings which at present occur in specifying materials belonging to the bitumen and asphaltic groups.

The report divides into three groups the materials now used in binding together the stones and other mineral aggregate used to form road crusts and road surfaces. These are:

1. The tars and pitches obtained by the destructive distillation of coal or similar substances.

2. The bitumens and asphalts which are found in nature, or are obtained artificially from asphaltic oils.

3. Chemical binders, including the Portland and natural cements which owe their cementing value as road binders to chemical action, and which are not dealt with in the present report.

Hitherto, as the London *Surveyor* points out in commenting upon this report, the term "bituminous material" has been loosely applied to tar products, as well as to bitumens and asphalts, but the committee have from the first considered that it was desirable from the road engineer's point of view, to maintain a sharp line of demarcation between the two groups. The views put forward in correspondence from America and by American engineers of standing and experience have been carefully considered, but the committee still adhere strongly to the view that the description "bituminous" should be applied only to the second group.

In England the first group of road binders, the coal-tars and pitches, have been in use for many years, and as the Road Board in 1911 issued specifications for the tars, tar oils and pitches which they recommend for road purposes, these materials have already, to some extent, been defined by those specifications. The Road Board, early in 1914, issued a second edition of these specifications. Only two classes of tar and one class of pitch are dealt with, and as these specifications, which form part of the report, are of such recent date, the committee recommend that they be adopted provisionally as the British standard specifications for tars and pitches used for road work.

The committee find that the choice of names for the second group of road binders is a matter of some difficulty. This difficulty is increased by the fact that, whilst it is desirable to obtain the concurrence of the American engineers to the nomenclature and definitions which the committee now propose, the adoption of the American nomenclature for the various materials composing this group would be liable to lead to confusion and misunderstanding in England.

The committee have been very anxious to secure uniformity with American practice, and have carefully and fully considered the definitions adopted by the American Society for Testing Materials, and by the committee of the American Society of Civil Engineers, put forward by the American corresponding members, but it is felt that the definitions now decided on are preferable from the road engineer's point of view, as they are based on those characteristics of the materials which can be most readily verified when employed for road making.

In accordance with this view the committee consider that it is desirable to make a sharp distinction between coal-tar and and paraffin oil derivatives on the one side and native bituminous substances and asphaltic oil residues on the other, and they are therefore unable to accept the American definition of bitumen—which would include the coal-tars.

The committee's report, the full title of which is "British Standard Nomenclature of Tars, Pitches, Bitumens and Asphalts, when used for Road Purposes, and British Standard Specifications for Tar and Pitch for Road Purposes," is obtainable at the price of 5s. 4d. (post free) either from the offices of the committee, 28 Victoria St. S. W., or from the publishers, Messrs. Crosby, Lockwood & Son, 7 Stationer's Hall Court, London, E. C.

The Municipal Supply Department III.

THE PURCHASING AGENT

By Hugh M. Foster, New York City.

The third article in this series is devoted to the purchasing agent, who is the most important person in the system and who must act as the central control of requisitions and the materials to supply their demands. The measure of success of the system depends almost entirely upon his ability to keep the balance between extravagance and niggardliness, and to keep in touch with departments closely enough to be able to foresee their wants and plan for their supply even before the inquiries are made which lead to the requisitions. Smooth sailing depends largely upon his personal characteristics and proper economy without pinching depends upon his strength of mind.

THE decentralized system, or rather lack of system, of purchasing supplies creates inefficiency which amounts to chaos. In that old-fashioned way of doing there is a purchasing officer, irrespective of whether his title be purchasing agent or merely clerk, for each department, commission, board or other minor division of the municipal government. Each buys independently of the other and there is a constant lack of uniformity of articles, prices, records and accounting, besides the knowledge and experiences of each one are unknown to the others. By a centralized supply department commissioners of the various operating departments would be relieved of the duties of purchasing supplies, and would consequently have more time to administer their departments, and that is their proper function.

Centralized purchasing, storing and distribution of supplies reduces opportunities for corruption by all purchases being concentrated in one officer subject to the check and criticism of the supply officers of all departments served. It increases promptness in settlement of claims and so gives the city an opportunity for cash discounts for prompt payment, and by the mere fact of promptness attracts a better and larger class of dealers, enhancing the service and tending to the reduction of prices. Centralized purchasing also gains the advantage of the ability and experience of all purchasing officers by constituting them as a board of assistant purchasing agents subordinate to the general purchasing agent.

The general purchasing agent and the general storekeeper are active checks upon one another, and the great advantage of this check is removed if either is made subordinate to the other.

The great advantage of the reduction in the number of contracts and purchase orders by the centralized system is an obvious advantage. In the city of New York there are one hundred twenty different officials who purchase supplies. As there are about fifty thousand vouchers for supplies passed each year and in clerical work alone it costs $1.35 to pass each voucher thru all the stages of official procedure, the reduction of this enormous number of purchasing all supplies thru one general purchasing agent and combining these heterogeneous vouchers would be an economy very much worth while, even if it were the only one.

An added economy, and many times larger than that of the actual reduction of purchasing transactions, would be the reduction in salaries due to the necessity for fewer clerical positions. As each minor purchasing agent of each department, commission, board or bureau now has a clerical staff under him, by assembling all these in one department the payroll for the purpose of purchasing supplies could be reduced to a minimum.

Any multiplication of purchasing offices causes delays in the transaction of business and leads to undesirable middlemen and vendors who have merely offices in their hats and it also leads inevitably to higher prices.

A good purchasing agent should make frequent investigations in the trade to keep in constant touch with the best current commercial usage. Also, he should acquire information from salesmen. Salesmen are habitually inclined to talk and this information from one may be checked by the opinions from another. The purchasing agent should subscribe to all trade and financial journals related to his work, and should maintain a file of government reports applicable.

In "The New City Government," by Henry Bruere, the advantages of centralized purchasing are roughly summarized as follows:

"It makes available to the city expertness in purchasing resulting from specialization in purchasing work;

It saves time, distraction and consequent loss of money and results for department heads and their subordinates by whom purchases must otherwise be made;

It permits of buying in large quantities instead of small quantities, thus securing uniformity of price and quality for the same article consumed in different departments;

It makes city business attractive to wholesalers or manufacturers, by increasing the size of orders;

It centralizes the point of contact between vendors and the city government, minimizing temptation to corrupt subordinates;

It locates responsibility for determining the price and quality of articles purchased and for the selection of reliable vendors;

It establishes an automatic check over deliveries in so far as supplies and materials bought by the purchasing agent are received and checked by the department which consume them;

It prompts the establishment of standards for various classes of supplies consumed by the city government;

It makes facile the enforcement of uniform business regulations with regard to requisitions, orders, invoices and vouchers."

The purchasing agent should also maintain a record of dealers, which should be an elaborately systematized card index showing general liability, established reputation, financial responsibility, qualities of goods and habits of delivery. From this record should be made his "black list" which alone should justify his rejection of bids from unworthy dealers. Such a record is almost as important as the indispensable records of invoices and prices.

The price record should be kept in card index form, with a separate card for every article; under the title of the article should follow a full technical trade description, below should

be columns for the name of the firm from whom prices were obtained, the date, the source of the price, whether bid, open market order, contract or unaccepted quotation by correspondence. With such a record, if it is made adequate and continued long enough, the purchasing agent is enabled to inform himself fully on the propriety of prices submitted.

(a) *Requisition*—The beginning of a purchase transaction is the requisition and for that reason adherence to standardization in the best modern practice should be insisted upon here. A requisition should be upon a standard form, one for general requisition and one for special purpose. It is better to have these two kinds on different colored papers so that attention may be drawn at once to the character of the need.

It is obvious that proper purchasing is defeated insofar as the requisition is improperly drawn. If it does not give full information of the requirement of the article needed the purchasing agent does not know what he is trying to buy. He is subject to the whims of dealers. And such improperly drawn requisitions should be returned immediately by the purchasing agent to the originator with a request that the desired information be given. Requisitions which do not specify accurately the grades of such goods as enameled ware, glass, butter, coffee or coal are practically worthless.

The high quality to be bought should not be necessarily the highest, but that which is best adapted for the purpose for which the article is needed. It should be remembered the city does not purchase on appearances as does a dealer. Ordinarily a dealer in any form of goods, whether he is wholesaler or retailer, buys on the prospect of selling and as appearances play a large part in that prospect, they are important to him. This factor will be readily appreciated if the articles of food or clothing are considered. A city, however, buys its supplies on an entirely different basis, that is, for its own consumption. The fact that canned goods or a particular brand of tea or coffee has not the fancy appearance of another should bear no weight in deciding purchase or inspection for city use. In fact, such a difference may be to the advantage of the city, as goods are sold largely on appearance in trade, the better appearing goods on a higher price, whereas the goods of inferior appearance may have quite as great intrinsic value and be far more economical to the city because of their lower price.

For such reasons it is important that requisitions give full description of qualities required. In all cases requisitions should indicate the serial number of standard specifications for articles which have been standardized. The purpose of standardization is defeated to the extent that exceptions are made to it.

(b) *Request for Bids*—Request for bids sent by purchasing agent to prospective bidders should show all the information given on the requisition which is necessary for a bidder to know to make an intelligent bid. It should also state all the terms under which the purchase will be made if consummated.

(c) *Bulletin Boards*—The best method of inviting informal bids periodically is the bulletin board. Upon the bulletin board in the purchasing agent's office are announced daily supply requirements, showing for each item the date when the bids will be opened. By this method all dealers interested are kept informed daily and know sufficiently in advance to make their bids profitable to themselves and fair to the city.

(d) *Assembling Requisitions for Periodic Buying*—The principal function of the purchasing agent is the purchase of supplies to maintain stock in the general storehouse. However, emergencies will arise in the best regulated system and special requirements cannot always be foreseen, consequently a constant stream of requisitions will be flowing into the purchasing agent's office. It is a waste of time and money for him to purchase supplies on these requisitions in the same rotation in which the requisitions are received. By assembling requisitions for the same supplies and buying periodically, even if such requirements do not amount to a sufficient quantity to warrant public letting and formal contract, still greater economies may be achieved by combination of many items into one purchase.

(e) *Relative Merits and Purposes of Open Market Orders, Contracts and Continuing Agreements*—The purchasing agent should receive daily reports from the general auditor or chief fiscal officer of the city, showing the condition of all appropriations for supplies. It is a waste of time to carry out all the preliminary procedure of a purchase only to have an order at the end returned by the auditor with the statement of insufficiency of funds. In return the purchasing agent should furnish the general auditor or chief fiscal officer of the city with a daily record of purchases and a monetary balance due on given appropriations. These two reports should harmonize.

The three general methods of purchasing supplies are by open market order, by contract and by continuing agreement. The extent to which the purchasing agent reduces the number of petty open market orders indicates his efficiency.

On the whole, it is generally advisable to enter into contracts for items exceeding $500 in one year, and continuing agreements for items of over $1,000.

There must, of course, be established a standard form of contract approved by the auditor or the comptroller or chief fiscal officer of the city and by the corporation counsel. Such a contract is entered into after public advertisement in addition to the bulletin board notices. Deposits for good faith are required of bidders and those of the unsuccessful bidders should be promptly returned. Upon the awarding of a contract, security is required for the full and faithful performance.

Supplies of the same general kind or classification should be included in one contract. The habit of putting a long list of miscellaneous supplies into one contract defeats the purposes of economical buying, because it encourages irresponsible middlemen who have no offices and carry no stock, but bid indiscriminately upon small and miscellaneous items. Upon being awarded such a contract, they simply transfer the order to various dealers and earn their living by commissions. Such method is a pure waste to the city.

All contracts should be awarded after line bids, that is, a separate bid for each item, based on the unit and total prices for each item. In this way the city can take advantage of the lowest price thruout a list of supplies, no matter how long, instead of awarding contracts to lump-sum bidders in the old-fashioned blind method in which unit prices were concealed. Lump-sum prices offer special facilities for unbalanced bids, by which, thru private information, a dealer bids low on an article which he knew would not be ordered except to a small extent, and bid high on an item which would be more extensively called for.

Seasonal contracts afford economies in certain classes of goods, such as fresh fruits and vegetables, and butter and eggs. Also, it is generally considered better policy to buy fresh fruits and vegetables by marketing and open market orders daily or weekly, according to the condition of the wholesale markets.

Continuing agreements have the advantage over contracts of being binding upon the vendor while they are not binding on the purchaser; that is, a dealer agrees to sell a given article at a given price during a given period to the city when the city is in the market for that article. Such an agreement is usually based on a percentage of price in advance of the lowest wholesale market for the raw materials, or upon a sliding scale of advances according to size and kind of such a thing as structural steel upon the quotation of steel at Pittsburgh. Continuing agreements may be terminated upon due notice from either party to the agreement.

A Municipal Commercial Club

By W. D. Hornaday, Houston, Texas.

The Municipal Commercial Club, which was advocated in an article in MUNICIPAL ENGINEERING *several years ago, has been established in Amarillo, Texas, under the title of "The Board of City Development," appointed by the Mayor and intended to be free from partisan or political influences or considerations and from the undue influences of particular business men or interests so often dominant in commercial organizations dependent entirely upon private subscriptions. This article gives a brief account of the success of the plan during the past two years.*

IT was on the well-founded theory that all of the people of a community should be required to bear their pro-rata of the cost of promoting the city's progress and general welfare, the same as they must do in the maintenance of all the other branches of the municipal government, that the Board of City Development was created by the city of Amarillo, Texas. It is a department of the city government of Amarillo and it performs the functions that are ordinarily delegated to commercial bodies that are maintained by private interests.

It is nearly two years since the city commission passed an ordinance creating this new branch of the municipal government. During that period the new plan has been thoroly tested and it is claimed that it has proved far superior in its working operations and actual accomplishments to the old method of privately conducted campaigns for the city's upbuilding.

The Board of City Development of Amarillo is supported by an annual public fund that is raised by means of a small tax rate that applies to every owner alike. It is not forced to favor any particular business man or interest, as is the case with many of the privately maintained commercial organizations that are dependent entirely for their support upon the subscriptions of local citizens. It is claimed here that the Board of City Development is as independent from the business interests of the town as any other branch of the municipal government. It endeavors to serve every man, woman and child in Amarillo alike. It is also stated that politics absolutely has no place in the department.

This breezy metropolis of the Panhandle not only has the unique distinction of having a Board of City Development but it was the fifth city in the country to adopt the city manager form of government. Assisting the city manager is a board of commissioners.

The ordinance provides that there shall be appointed by the city commission not to exceed fifteen directors of the Board of City Development. These directors "shall be citizens of Amarillo, of good and reputable standing, such appointments to be free from partisan or political influences or considerations." Each director is appointed for a term of two years and the terms of one-half of the membership expire every year.

One of the important stipulations of the ordinance is that any director who misses three regular consecutive meetings shall be automatically removed from office, unless, at the next regular meeting of the board after such absence, he shall submit in person or in writing legal excuses that are acceptable to the other directors.

Another provision says: "The Board of City Development of the city of Amarillo shall have general supervision over all matters pertaining to the work of the usual Chamber of Commerce or Commercial Club, such as the legitimate fostering, exploitation, encouragement and development of the agricultural, stock, industrial, manufacturing, jobbing, distributing, and wholesale and retail commercial resources, and securing of desirable immigration, encouraging social and commercial intercourse, improving transportation facilities, desirable publicity, more and better highways, and in furthering the advancement of existing agricultural, stock, industrial, manufacturing, jobbing, distributing and wholesale and retail interests, or any other matter that has for its purpose the upbuilding and growth of Amarillo or benefit of its citizenship."

The tax rate for the maintenance of the department is fixed to not exceed two mills on the one dollar of valuation of the taxable property in the city. While this tax is so low as to hardly be felt by any property owner, it brings in an annual fund that is much larger than that which is ordinarily raised by private subscription for similar work in towns of that size. The expense is evenly distributed among practically all of the people. The secretary of the Board of City Development is required to file with the city manager monthly reports of all receipts and expenditures. All warrants or vouchers for expense and work of the department shall be issued only on requisition of the city manager and by order and approval of the Finance Director of the department, and such warrants and vouchers shall be audited and approved by the city commission.

BUSINESS STREET IN AMARILLO, TEX.

The secretary of the Board of City Development is required to file with the city manager for the information of taxpayers monthly reports of work accomplished or in contemplation by that department. By following this method the people of the city are able at all times to learn for themselves just what is being done and in prospect by this branch of the municipal government. It is provided, however, in the ordinance that the city commission shall take no hand in the policies or work of the City Development department.

The Board of City Development must hold two regular meetings each month. The directors shall serve without pay. As an evidence of the public spiritedness of the citizens of Amarillo, no difficulty was experienced in enlisting the services of men of proved and well recognized ability in their respective lines of business to serve on the board without re-

muneration. The secretary and assistants are elected by the directors outside of their own number and these employes are paid salaries commensurate with the important duties that they perform.

The Board of City Development as now composed consists of S. F. Fullenberger, president; Porter A. Whaley, secretary; H. A. Nobles, financial director; Hamlin Palmer, traffic manager; Walter D. Allen, vice president; L. B. Newby, publicity; J. M. Walsh, transportation; J. Marvin Jones, legislation; E. W. Hardin, trade extension; W. S. Rule, industrial; Ford Brandenburg, entertainment; A. Eberstadt, immigration; Charles W. Ebel, insurance.

Thru the harmonious working of the different branches of the department, an enormous amount of material good has been accomplished for Amarillo during the last two years. Shippers and the business element generally of the city have received much benefit as a result of the well-directed activity of the bureau of transportation and rates. It is the duty of this particular unit of the Board of City Development to investigate the transportation questions, both freight and passenger, affecting Amarillo and its tributary country, not only as to rates, but also in all matters pertaining to railroads, or the State Railroad Commission, the Interstate Commerce Commission or any other executive or legislative body, for the purpose of obtaining information, or for securing assistance or relief, where unfavorable conditions exist.

The trade excursion bureau has succeeded in extending Amarillo's trade territory, and thru co-operation with local merchants, wholesalers, retailers and jobbers, the importance of the city as a trade center has been greatly enhanced. Trade excursions have been promoted and the people of the tributary country have been brought into much closer personal and business relations with local merchants than formerly.

RESIDENCE SECTION OF AMARILLO, TEX.

The establishment there of a number of important new industries and commercial enterprises is directly traceable to the activities of the bureau of industries.

Every citizen of Amarillo takes pride in the wonderful progress that has been made in civic affairs during the last two years under the direction of the bureau of civic affairs of the Board of City Development. This branch of the department handles all matters pertaining to parks and playgrounds, sewerage, sanitation, street lights, water supply and various other things that have for their purpose the general welfare of the people. In this work the bureau has had the active co-operation of the local Federation of Women's Clubs.

The value of the right kind of publicity is well recognized by the publicity bureau of the department. It is its duty to disseminate statistics and information concerning the advantages and resources of Amarillo and surrounding country with the special view of soliciting and securing personal investigation on the part of persons seeking new locations.

That Amarillo is the center of a vast wheat growing and stock raising territory is well known to the outside world. The progress that is being made along these lines is said to be due, in part, to the work of the bureau of agriculture of the Board of City Development. It has gathered data bearing on the agricultural, live stock and dairy interests of the Panhandle and promoted the harmonious co-operation of the citizens, stockmen and farmers in the development of their common interests. It has encouraged the organization of farmers and allied interests for their mutual good.

When visiting homeseekers and prospective investors come to Amarillo they are taken in charge and entertained under the auspices of the bureau of reception and entertainment. This branch of the department also looks after all convention and public meeting matters, in conjunction with the bureau of conventions director.

An unusually large number of new settlers have come into the Panhandle region during the last several months, and this influx of homeseekers is due largely to the work of the director of immigration of the Board of City Development. One feature of the activities of this bureau has been to eliminate the reprehensible and dishonest methods of certain classes of land agents. It has also secured advantageous rates from railroads for immigrants and has co-operated along lines of mutual benefit with similar organizations in other towns and localities for the same general results.

The construction and improvement of the highways leading into Amarillo have received the attention of the bureau of highways. It co-operates with similar organizations in other counties and communities in the establishment and maintenance of local and overland automobile routes, and looks after the proper erection and maintenance of signs and signals for the convenience and guidance of travelers.

The bureau of legislation is charged with the duty of investigating and reporting to the Board of City Development upon all matters of local interest which should be acted upon, are being acted upon, or are under consideration for legislative action, whether city, state or national, for such action as the Board of City Development may designate.

Material reductions of the local fire insurance rates have been wrought thru the work of the insurance branch of the department by bringing about an improvement in the standard of fire protection.

It is the opinion of men who have investigated the practical workings of the Board of City Development of Amarillo that the wonderful success that it is meeting with in the operation of its different branches will ultimately attract wide attention on the part of the people of cities and towns where problems and dissatisfactions exist with privately maintained commercial organizations.

The Amarillo plan has already been placed in operation to a limited degree in Corpus Christi and one or two other towns in Texas.

A considerable number of the 18,000 people who make Amarillo their home are wealthy stockmen who have retired from their ranches and have built beautiful residences. The cleanly and well-kept appearance of the city is not confined to the residence portion but is specially noticeable in the streets of the business district.

Mysteries of Concrete Road Construction

By W. H. Reed, President of Washington State Association of County Commissioners

While we will not all agree with the author that all the reasons for disagreement over the details of concrete road construction which he enumerates are mysterious, his paper is one which supplies much food for thought and he puts his points in a manner which attracts attention. He demonstrates that he is an apt pupil if he has learned all he knows within the last three years. The Road Builders' Institute held at the University of Washington was fortunate in having so forceful a leader of its discussion of concrete for roads, however it may have agreed or disagreed with him.

MYSTERY No. 1; Sub-Grade: When I took office as county commissioner of Pierce county, in 1913, the value of a flat sub-base was not generally appreciated. I had been taught it in my road construction course in the Washington State University, by Prof. C. C. May. It happened in this way that I took the course: Being nominated for county commissioner, and knowing I was going to be elected —as all candidates do—I applied to obtain this instruction in an effort to fit myself, in a measure, for the commissioner's job. Fact was I didn't know anything about road work, and I didn't want the sheriff to nab me after I took office for obtaining money under false pretenses. In the spring of 1913 I recommended to our county engineer the flat sub-base. I had had no practical experience, and he and his chief deputy had, and they opposed it. So, I gave way to their experience. But next year, 1914, they both agreed with me that the flat sub-base was the better base up to a width of 20 feet. Now, the mystery is, that at this late date in pavement construction, highway engineers of acknowledged ability are differing on the question of a crown in the sub-grade or flat sub-grade, and some even advocate a dished sub-grade. The report of the committee on preparation of sub-grade, made to the second National Conference on Concrete Road Building, February, 1916, made no recommendation, neither did that conference. The committee reported: "The opinion seems to be gaining ground that a flat or dished sub-base, with the slab thickened at the center, is best suited to resist cracking, as well as to withstand heavy loads." Mr. Jos. W. Hunter, first deputy commissioner, Pennsylvania State Highway Department, says: "The camber or slope of the sub-grade should be the same as that of the finished pavement wherever practical." Mr. W. A. McIntyre, chief highway engineer of the Association of American Portland Cement Manufacturers, said, as published September, 1915: "Up to widths of 20 feet, the sub-base should be built flat." April 10, 1916, Engineer McIntyre wrote me in answering my suggestion for amendments to the specifications of his association: "It may not always be economical or advisable to have the sub-grade flat. If the road is reinforced, and in many cases where the sub-base is hard, a crowned base may do no harm. In fact, there are many, many concrete roads and streets built with a crowned sub-base giving entire satisfaction." And they continue to disagree—tho more unanimously.

Mystery No. 2; One or Two-Course Concrete: Until very recent years the leading highway engineers of this nation have recommended cement concrete pavements in two courses, and a two course pavement was generally built. So conflicting have been the opinions of road construction authorities, even including the last few years, that no national meeting, in this country, on road construction, has been willing to declare itself on this question, until the Second National Conference on Concrete Road Building was held in Chicago, February, 1916. That Conference passed this resolution: "When materials most readily available are such as to give good construction in one course pavement, this Conference recommends that the one course be used." The question naturally arises, Why wasn't it commonly known, by road builders, long ago, that a one course construction, with good materials conveniently located, was the best construction? As late as 1914 the Washington State Highway Board disapproved the specifications for a cement concrete pavement, sent them by Pierce County, under the Permanent highway law, because those specifications provided for a one course pavement. Mr. M. Roy Thompson, our very capable county engineer, and myself, as chairman of the Board of County Commissioners, went to Olympia and sufficiently weakened the Highway Board's opinion on this subject that they, doubtingly, approved of our one course type.

Mystery No. 3; Mineral Aggregate: Little attention has been given, until recent years, to the grading of the sand and gravel by graduating it from powder to a 1½ or 2½-inch rock, with density in view, with the object of reducing the voids to a minimum in cement concrete for pavements. In 1913 the Warren Brothers Co. obtained ownership of a patent then issued on the grading of the mineral aggregate, which they used in the construction of their Warrenite or Bitulithic roads. So valuable was this idea of grading their mineral aggregate in effecting a reduction of the voids in their pavement work to 21 per cent. and less—to even as low, I am told, as 11 per cent, that they have been and are able to sell the right to use this mineral grading idea, in laying a bituminous pavement, for a royalty of twenty cents and more per square yard. They are asking Pierce County today not less than 26 cents. In the face of this knowledge, for all these years, by all highway engineers, it is only in recent years that a comparative few have been and are availing themselves of it, as they can, without any royalty, in the construction of cement concrete pavements. That's mystery No. 3.

Mystery No. 4; Time of Mixing: It has been the common practice to churn the aggregate in the mixer for 45 seconds. That a longer time should be given to this churning or mixing, and that there was an economic time limit for mixing, was not known by more than a few until the last few years. And the majority don't act on it even now. Yet this was a knowledge easily obtainable. Taking the same material and proportions in coarse and fine aggregate and cement, inexpensive tests in mixing for various minutes and fractions of a minute of time, up to five minutes, would have supplied this valuable knowledge to *all* who had any disposition to be thoro and obtain the best possible results. Mr. William D. Uhler, chief engineer, Pennsylvania State Highway Department, reports upon a road now under construction:

> "Every batch of concrete is mixed for one and one-half minutes; the reason for this being that a number of experiments, made during the progress of the work, indicated that the greatest strength, commensurate with economy in cost of mixing, was obtained from a mix of this timing. The experiments which resulted in this conclusion were are follows:
>
> ½ min. mix 9 revolutions, 8 day test, 1,400 lbs. per sq. in.
> 1 min. mix 17 revolutions, 8 day test, 1,587 lbs. per sq. in.

A CONCRETE ROAD IN AN ILLINOIS RIVER BOTTOM. FLOODS RUINED ALL PREVIOUS ROADS.

1½ min. mix 26 revolutions, 8 day test, 1,926 lbs. per sq. in.
2 min. mix 36 revolutions, 8 day test, 1,661 lbs. per sq. in.
3 min. mix 51 revolutions, 8 day test, 1,673 lbs. per sq. in.

These figures demonstrate that a 1½-minute mixing, in a first class machine, is the maximum profitable time for mixing. On the Coleman-Dupont cement concrete road now building in Delaware, as a model concrete road, they require—having proven its advantages by testing—that each batch of concrete be mixed for 1½ minutes. But why have we delayed to 1915 and '16 before intelligently investigating and solving this question? Even yet it is a disputed question.

The "Standard Specifications for One Course Concrete Highway," issued by the National Association of Cement Users, says of mixing: "Mixing shall continue after all materials are in the drum for at least one minute at a minimum speed of twelve revolutions per minute." I wrote them last March recommending some eight changes in their printed specifications, which included a change to a 1½-minute mix. It is really an association not of "users" but the "Association of American Portland Cement Manufacturers." Their Chief Highway Engineer, Mr. W. A. McIntyre, replied: "Your comment regarding the mix is an excellent one. * * We realize fully that a minute and a half or probably longer, is very desirable." Nevertheless he adds: "We believe that the increase in strength obtained by mixing longer than one minute will not warrant the extra time." Refering back to the Pennsylvania Highway Engineer's figures we have evidence that the increase of strength from a half minute mix to a minute mix is 167 lbs. to the square inch for this additional half minute, and that the increase from a minute mix to a minute and a half mix is 339 lbs. per square inch for this additional half minute. Without attempting to criticise Engineer McIntyre's recommendation of a one-minute mix (for he must be a more capable man on this subject of cement concrete road construction than am I, by reason of his much greater experience) I marvel at the possibility of a disagreement, in this year 1916, wherein the Chief Engineer of the Pennsylvania Highway Department, with Mr. Chas. M. Upham, the chief engineer on the Coleman-Dupont model cement concrete road, require a 1½-minute mix, and so prominent an authority as Enginer McIntyre recommends a one-minute mix. Six months, or less time, devoted to careful, intelligent, innumerable tests, can solve this question so that no builders of cement concrete pavements can thereafter be of two opinions on this question of the maximum economic time for a mix. Hence, why isn't it solved? Possibly it is because it is part of the universal effort not to think. Obviously it would pay the Association of American Portland Cement Manufacturers to have this mystery solved.

Mystery No. 5; Steel Plates: Among my eight suggestions for amendment of these "Standard Specifications" of the Association of Portland Cementn Manufacturers, I advised that they omit their recommendation of steel plates for joint protection, for the reason that it was not "now approved by the best practice." Their Chief Highway Engineer, Mr. McIntyre, replied: "We must disagree with you in your statement that according to the best practice steel plates have been abandoned. Probably more steel plates are used today than previously." My objection to protection plates is because of the considerable difficulty, usually experienced, in getting these plates properly installed. Contractors and their men will seldom give the time necessary to proper installation. If they are placed low they are of no benefit. If placed too high they are a bump in the road. Moreover, a quarter inch of a prepared-pulp-tarred-joint filler is cheaper, and is, I believe, much better, with the adjoining edges of the concrete thoroly troweled and rounded. In my investigation of a cement concrete road constructed by the U. S. Government, at Presidio, near San Francisco, I learned that the edges next to the joint filler had been sprinkled with iron oxide. This hardened the edges against the possibility of their breaking off by traffic. The Second National Conference on Concrete Road Building, held February, 1916, in their resolutions said: "The tendency of present practice is toward the omission of metal protection plates for joints."

There you are! Suspended, mentally dangling in the air, even on the question of joint protection plates. We don't appear to know what we know when we know it. What's the reason? What's the solution of this mystery?

Mystery No. 6; Curing and Protection: I suggested to the Association of Portland Cement Manufacturers that their stated time for curing should be increased from 14 to 30 days. Their specifications read: "Under the most favorable conditions for hardening in hot weather, the pavement shall be closed to traffic for at least fourteen (14) days, and in cold weather for an additional time, to be determined by the engineer." To my advice that the road should undergo a curing for at least thirty days before being opened for traffic, their Chief Engineer wrote me: "We agree with your suggestion that the roads should be closed 30 days and we endeavor to secure this wherever we are in touch with any piece of work. In a great many places, however, there are no cut-off roads and the pressure brought to bear on the engineer and the contractor by the general public is so great that the result is the road is opened prior to the 30-day limit." I know, from my own experience of the road construction of Pierce County, that the public is always seeing only their immediate convenience, without any consideration for the life of the pavement and their future convenience and welfare as taxpayers: When you get right intimate with the public you find it to be like a lot of children. I say this with apologies to the children—for I am very fond of children. Engineer McIntyre added: "In most cases 14 days can be obtained and under good weather conditions will be satisfactory. However, when the weather is cool the 30 day period must be insisted upon." For 14 days, at least, the concrete should be covered with earth to a depth

of two inches or more, and this earth kept wet for that period. Hence, for 14 days in summer, "weather conditions," either good or bad, are immaterial, as the weather is blanketed against.

That cement concrete is much stronger at the end of four weeks than at the end of two, has been repeatedly proven by tests. Therefore, "good weather conditions," or public clamor, should not induce the opening of a cement concrete pavement in 14 days. Of that I am certain. Practice in the curing construction of the Coleman-Dupont Model Concrete Road, is this: "Immediately after the concrete was finished wooden frames covered with canvas were placed over the concrete, to protect it from the sun or wind. These were kept over the concrete for 24 hours, after which the concrete was covered with earth for a depth of 2 in. and kept wet for a period of 14 days. After 30 days this covering was removed and the concrete allowed to harden for two weeks before traffic was allowed on it." Thus closed a total of 60 days after the concrete was laid. This, I believe, is the best practice, though it is the only instance I know of. Its a very difficult thing to keep a pavement closed against a short-sighted clamorous public. But it is far less difficult in the less settled and less improved West, where nearby temporary roadways can far more easily be obtained. It's a mystery to me why manufacturers of cement can't see that it is better, for them, in the long run, to lose a contract, occasionally, on the argument that a cement concrete pavement necessitates closing the road to traffic longer than with other types, rather than discredit their type of pavement by shortening its life.

Our experience in Pierce County was a valuable lesson on the importance of doing all parts of the cement concrete pavement work thoroly well. Let us tell you about it: We laid a cement concrete pavement, by contract, in 1913, which became infamously known as the "Ollar Road." We tried, but we couldn't solder it up, or putty it up, so it would stay stuck, as a solid should. In a very few months after completion it became known thruout the coast as the slowest speed track in the western circuit, though it was amply provided with parabolic curves. In some six or eight months time its condition had become so atrocious that drivers of automobiles hesitated—in the absence of traffic regulations—whether to undertake to go under, over or thru it. And yet—and herein is one of the allurements of a cement concrete road, which is always on tap—we charitably hid its shame by humanely spreading a sheet of asphalt over the residue and, Lo! there was a metamorphosis to a No. 1 sheet asphalt pavement. That's a miracle which can't be successfully performed on any other type of disintegrated pavement.

Mystery No. 7; Cracks: Mr. T. H. Johnson, City Engineer of Sioux City, Iowa, in a paper read before the Second National Conference on Concrete Road building, last February, stated that Sioux City had "continuous miles of this pavement *without a single cracked section*," * * "some of it 5 years old." "In other words," he said, "at Sioux City we are laying practically a crackless pavement." He gives as the cause: density of the materials, the working out of the moisture, and "reducing the future absorptive powers of the slab, by this finishing work." "7½ per cent of the volume of the aggregate," he states, "is free water—making 7½ per cent of voids in the mass when evaporated." He goes on to say: "After bringing this free water to the surface we apply a dry mixture of 1 part cement and 1 part fine aggregate, in sufficient quantity to absorb all free water." Mr. Jos. W. Hunter, First Deputy Commissioner of the Pennsylvania State Highway Department, in a paper read at the Thirteenth Annual Convention of the American Road Builders' Association, February, 1916, said: "Concrete as a pavement laid upon an old telford foundation (which gives perfect drainage) showed no cracks after being down for more than eight years." In the April, 1916, issue of a prominent magazine devoted to road construction, it is said: "Cracking is the feature most objected to in concrete roads; and it is coming to be the belief of practically all highway engineers that given good foundation and drainage, the most productive cause of cracking is the use of too much water in the mix." "Coming to be the belief." Therein is the mystery: Why is it that it has taken all these years for highway engineers to just begin to know this? The conclusion I have reached from my studies on the building of a cement concrete pavement is that *density* is of exceeding importance. Varying porosity means varying strength and varying cracking.

I don't deny the statement from the Engineer of Sioux City that there they have consecutive miles of cement concrete roads, four years old, without a crack. I don't undertake to question the statement of Pennsylvania's First Deputy Commissioner, that a cement concrete pavement laid, on an old telford foundation, eight years old, showed no cracks; but I do say, that a cement concrete pavement laid, as I have herein indicated and given authorities and reasons for its being laid, will develop very few cracks—so few as to be comparatively negligible in maintenance cost.

A cement concrete pavement properly constructed has the following recommendations: It is attractive in appearance; lowest in first cost; low in maintenance cost—and, I believe, the very lowest in the long run; smooth, yet non-slippery; easily cleaned—wind cleaned, as it requires no curbs; and is the one pavement which improves with age, by growing harder and stronger. If a cement concrete pavement could be constructed so as not to develop *any* cracks, thus eliminating *all* cost of maintenance, it would be in every respect superior to every other type of pavement, for country roads, excepting that it lacks resiliency for horse traffic—and this is becoming, rapidly, a horseless age.

The answer to all my seven listed mysteries, is concentrated in this: Lack of thoroughness in the American people—plus short-sightedness of the cement manufacturers in not more actively discouraging inferior workmanship. Because of said short-sightedness and the cement manufacturers' frequently evidenced disposition to boost the price of cement, I sometimes wish there was an *open season* for cement manufacturers.

LEGAL DECISIONS

Decisions of the Higher Courts of Interest to Municipalities

Re-assessment for Excess of Cost Over Original Estimate Not Legal.—Under the law existing in 1907 (Ballinger's Ann. Codes & St. § 943) and governing the procedure for levying assessments for street improvements in cities of the third class, there can be no re-assessment of property benefited in excess of the original estimate, even tho such estimate fall below the contract price or actual cost of the improvement. City of Chehalis (Wash.) v. Robinson et al., 152 Pac. 696.

Water Company Liable for Diversion of Stream Same as tho Lawfully Condemned.—Where a water company, vested with the power of eminent domain, appropriates water without exercising such power as the statutes require, it is answerable to the landowner in the same, measure of damages being the difference in market value of the land affected before and after the injury, as if appropriation had been lawfully made. Rider v. York Haven (Pa.) Water & Power Co., 95 Atl. 803.

Status of Contract Between City and Water Company under Public Utility Commission.—A contract between a municipality and water company, prescribing rates to be charged to private consumers, and providing also for hydrants and street sprinkling at the public expense, was not supplanted by a later contract relating to municipal water consumption alone, without reference to private consumption, assuming that the rule that a later statute covering the whole subject-matter will be deemed to repeal previous legislation on the subject, applies to contracts. Notwithstanding a contract between a municipality and a water company, prescribing rates to be charged private consumers, the board of public utility commissioners was acting within its jurisdiction in authorizing a higher rate, which was not unjust or unreasonably high, since the state, thru a specially constituted agency, assented to the change in rate, and the state may waive contract rights due to the public without impairing the obligation of contracts in violation of the Constitution. Boro of North Wildwood (N. J.) et al. v. Board of Public Utility Commissioners et al., 95 Atl. 749.

Liability of Contractor and Surety for Labor Certificates Issued.—Where a highway contractor's bond given under Burns' Ann. St. 1914, § 7723, contained only the provision of that statute that such a contractor "shall pay for any labor or material that shall have been furnished to him, any subcontractor, agent or superintendent," such bond did not secure repayment of money loaned to the contractor to pay his labor. Where a highway contractor's bond given under Burns' Ann. St. 1914, § 7723, contained the provision of that statute that the contractor "shall pay for any labor or material furnished to him, any sub-contractor, agent or superintendent," such bond did not inure to the benefit of persons who, in view of the financial embarrassment of the contractor, assumed to complete the work and furnish the necessary funds to carry out the highway construction. Where a highway contractor in embarrassed circumstances issues certificates to his labor, showing the amount of time each individual had worked and the amount due him, which were purchased from the laborers directly by third persons, and an assignment to such persons in writing taken by them, the certificates remained the debts of the contractor in the hands of the purchasers as if they had remained in the hands of the laborers, so that such persons could go against the contractor and his sureties on his bond securing the payment of his labor. Smiley et al. v. State (Ind.) ex rel. Truax et al., 110 N. E. 222.

Resurfacing Not Repair.—The work of improving a park boulevard was not repair work merely because the park commissioners proposed to use the base of the old pavement as the base of the pavement contemplated in the improvement, but was such a first improvement of the street as the park commissioners were authorized by Acts of June 16, 1871, and June 21, 1895, to make by means of special assessment. South Park Commissioners v. Wood et al. (Ill.), 110 N. E. 349.

Water Company Can Furnish Water Outside its Parent Municipality.—That a water company furnished a portion of the water appropriated to persons outside the limits of the territory in which it had a right to furnish water to the public did not render the appropriation unlawful, especially where only a small amount of water was so furnished, and the furnishing of same was a mere incident to the main purpose of the company; the company being answerable only to the commonwealth for an improper use of the water appropriated. Mier et al. v. Citizens Water Co. (Pa.), 95 Atl. 704.

Assessment of Cost of Water Service Connections is Valid.—Burns' Ann. St. 1914, Sec. 8655, declares that the common council shall have power to regulate private connections with water mains and to compel owners to make such connections before the permanent improvement of a street, and, on default, authorize the proper city officials to do so at the owner's expense. A municipality ordered the making of connections with water mains before the permanent improvement of a street, the ordinance providing that in case of default the connections would be made by the city. *Held* that, as the legislature had decided that such expense should become a lien on the property and as the city was acting under the police power, a property owner could not defeat the assessment on the ground that it was made in a summary way. City of Angola (Ind.) et al. v. Croxton, 112 N. E., 385.

Elevation of Flow Line Sufficient Description of Land to be taken for Reservoir.—Where the board of water commissioners of a city filed a taking of "the right to flow to an elevation not exceeding twenty (20) feet above mean low water in the Merrimac river such of the lands" described "as will be flowed as a result of the maintenance of a dam," duly described, from which the owner, previous to flooding, could not tell how much of his land was taken without the aid of a surveyor, such taking was sufficient. Lunt v. City of Newburyport (Mass.), 112 N. E., 481.

FIRE DEPARTMENT

Causes of Truck Tire Breakdown

The accompanying cuts were selected by A. H. Leavitt, of the B. F. Goodrich Co., Akron, O., to show the results of various abuses to solid truck tires.

Overloading—The first picture shows a photograph of an actual tire, which was overloaded in service. The dangerous effect of overloading cannot be overestimated. Tires are constructed to carry certain loads, which, if exceeded, will result in premature failure of the tire units. Rubber compressed beyond its safe limit of elasticity, will break down just as any other material will do. Rubber compressed to such a limit, is also much more susceptible to damage from road obstacles. Continued overloading is not required to ruin a tire, as one excessive load or a blow developing equivalent force from high speed may do it, and a permanent rupture to the structure is likely to follow. Avoidance of overload and proper care of tires are of first importance in the economy of operation.

Speeding—This shows a tire injured through overspeeding and you will note the results are similar to the injuries resulting from overloading. The effect of heat generated within the tire, due to rapid displacement and road friction, is too well known to require further comment. When striking obstacles at high speed, the possibility of rupture is much increased.

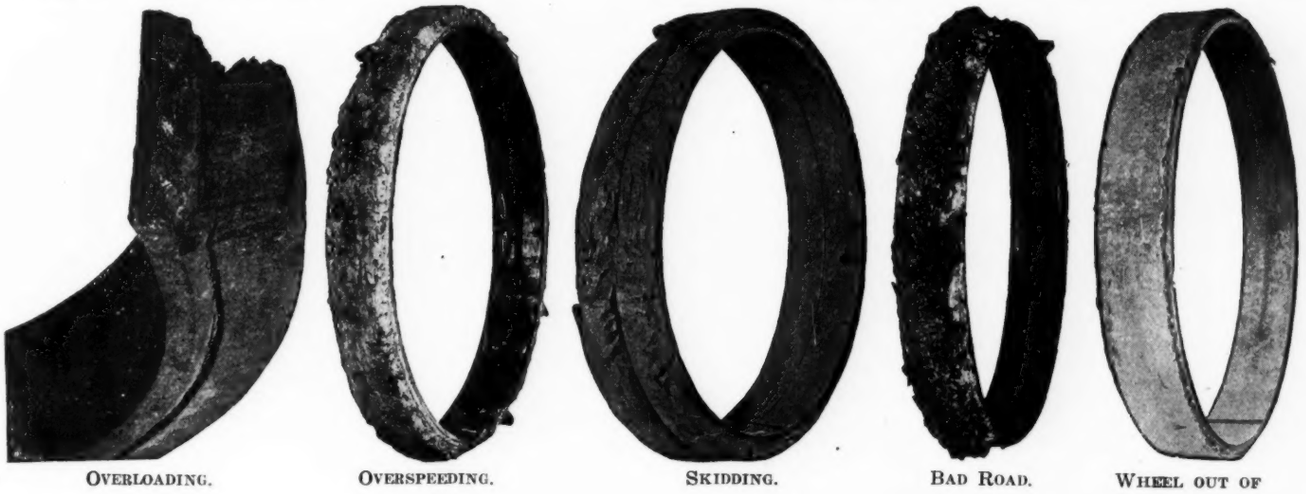
Speeding—This shows a tire injured thru overspeeding Skidding or locking the brakes and sliding the wheels results in serious and most uncalled for damage. This has a ruinous effect on the mechanism of the truck, as well as causing great damage to the tread of the tire.

These tires were practically new, from which the tread was completely torn away for a short distance, as a result of this skidding. It is a matter of fact that a truck will not stop as quickly by sudden application of the brakes as if the brakes were applied slowly and firmly. Another thing is the possibility of improperly adjusted brakes, which will sometimes permit one wheel to lock while the other runs freely. This same condition is also found on apparatus which turns corners at a high speed, which naturally increases the side strain and wear on the tires.

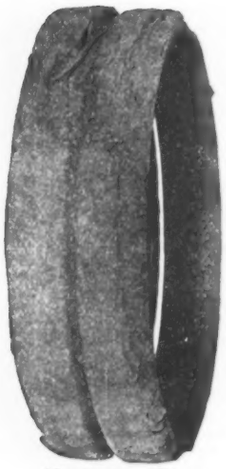
Bad Roads—One of the elements most destructive to solid tires is bad roads. You have already seen the results of overloading, excessive speeding, etc., but regardless of any precaution which you might take in respect to these, if a heavily loaded piece of apparatus is habitually used over bad roads, the tires receive abuse, such as will materially affect their life. In the past few years alone the city of Baltimore has spent $7,000,000 in street improvements which have resulted in greatly increased tire and car life.

This photograph shows a tire from a truck used for hauling building supplies and which was continually run over crushed stone, loose bricks, etc. In order to get maximum service, tires must be run under reasonable road conditions.

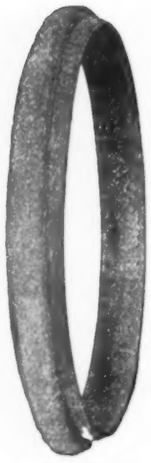
Wheels Out of Alinement—This tire looks as if it had been worn down perfectly smooth in service, but as a matter of fact, it only gave a few hundred miles of service. The cause of this quick wearing of the tire was due to one of the wheels of the apparatus being out of alinement. The effect on the truck, when a wheel is out of alinement, is that of continual



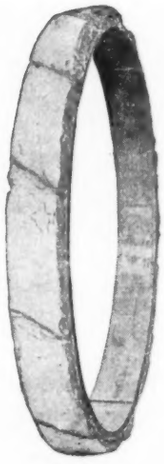
OVERLOADING. OVERSPEEDING. SKIDDING. BAD ROAD. WHEEL OUT OF ALIGNMENT.



NEGLECTED CUTS.



RUNNING IN CAR TRACKS



ANTI-SKID DEVICES

friction, as the wheel partly rolls and partly slides. Wheels should be inspected often and when this condition is found, immediate steps should be taken to remedy it.

Neglected Cuts—This photograph shows tires injured by cuts which have been neglected. Cuts on solid tires are more or less a common occurrence. This is, of course, governed largely by the road conditions. The ultimate effect of a cut depends upon the size and location, as cuts near and at the edge are most injurious, and if neglected may seriously affect the life of the time, as the tendency is always toward the cut enlarging, especially in circumferential direction. Some trucks are backed up a great deal and the cut consequently follows both ways from the injury.

The weakening of one unit of a dual tire in this manner naturally throws an overload on its mate at the point of injury, which may cause it to fail, as in this case.

To prevent the continuation of a cut on the edge, it should be trimmed.

Car Tracking—You have undoubtedly all seen not only the motor-truck driver, but also the horse-truck driver proceeding down the street with all wheels of the truck or wagon in the car tracks. It is unquestionably much more comfortable to ride in the car tracks on some streets than it would be on the streets themselves. However, this picture shows you the results of running solid tires in car tracks. The entire load is thrown onto one-half of the tire tread, with the result that it is rapidly worn or broken away on one side, eventually leaving the width of the tire reduced by one-half to carry the original full load. It is obvious that a tire will prematurely fail under these conditions.

Non-Skid Devices—This illustration shows the injuries resulting from the use of anti-skid devices, which were improperly applied. Unfortunately we know of no anti-skid device that does not, to some extent, injure solid tires. Some devices are more injurious than others. The loose chain has been found the least so because it works itself around the wheel and provides an equal distribution of the wear and strain. Stationary devices are most injurious, because the wear and strain are constantly confined to the points of bearing.

Chains of various design which pass circumferentially around the wheel and between dual tires place a strain on the tire base and are generally ineffective because dependent upon the compression of the tire tread to allow the device to secure traction.

The traction wheels are liable to spin more or less in slippery places, which produces a sharp blow on the tires where these devices are in contact. The force of such blows increases as the distance between the cross pieces of the devices increases, because of the momentum the wheel gains between these points. Less injury will result if such devices are only used temporarily. It is also advisable to use a device having numerous cross pieces.

Great injury results to tires from careless and continued use of anti-skid devices on pavements or hard roads where there is little or no need for them.

Fire Department Notes

JOHN W. CASE

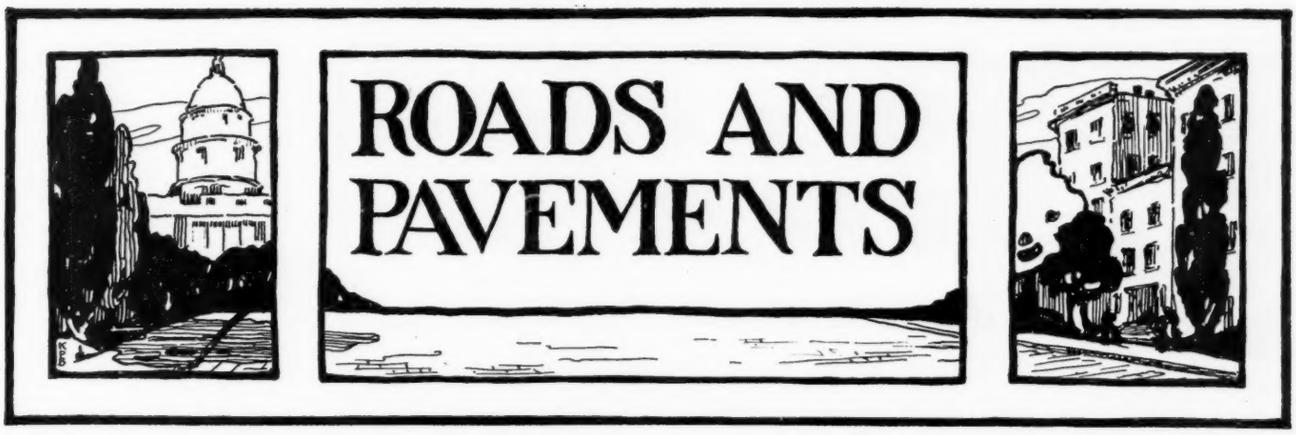
M. S. PHILIP

H. W. PARKER

Chief H. W. Parker joined the fire department of Stamford, Conn., at the agé of twenty-six, as a call man, when the department was changed from a volunteer organization to one with part paid and part call force. After two years' service, he was made call assistant chief in 1887, and on the death of Chief Bowman, he was made call chief in 1903, being promoted to chief of the department when he was put on full pay in 1905. Many improvements have been made under his administration, including new fire station and equipment in 1900, two new stations in 1909, a new three-story central fire station recently completed, a modern alarm system in 1906 and the motorizing of the department, which now includes a Pope-Hartford chief's car, a Locomobile chemical and hose combination, five years old, and three American-La France machines purchased at intervals of two years, being one gasoline pumper with hose, one gasoline pumper with hose and chemical and one new motor aerial truck. The department has thirty-five full-time men and covers an area of 7½ square miles, of which 3 miles are within the fire limits.

M. S. Philip, chief of the fire department of Chicago Heights, Ill., has been nineteen years in the service, sixteen years as volunteer, serving in all grades, including assistant chief and three years as the first paid chief of the department. The force has grown to include thirteen paid men and twenty-two volunteers, and an increase of two captains and six men is recommended. An Ahrens-Fox booster pump combination hose auto truck, a new combination motor hose truck and the chief's auto are in use in addition to horse apparatus, consisting of two steamers, hose wagons, hook and ladder truck and two exercise wagons. The department is well drilled and is performing very efficient service, as shown by the annual report of numerous runs and the small fire loss.

John W. Case, chief of the central fire department of Jefferson City, Mo., is a young man who quickly demonstrated his capabilities, for he became a fireman August 1, 1911, and was promoted to chief on April 15, 1912, being reappointed last year. The department has a motor hose wagon and fully paid men who keep the fire loss below $10,000 a year, altho the number of calls was over 60, 87½ per cent of the fires being extinguished by chemical.



Road Paving Around Ashokan Reservoir

In a recent paper presented before the Municipal Engineers of the City of New York, Messrs. F. B. Marsh, J. D. Gross and Chas. E. Price have described in an interesting way the preliminary studies, construction and inspection of pavements built about the Ashokan Reservoir, now nearing completion under the administration of the Board of Water Supply of New York City.

Mr. Marsh says: "After careful consideration of all suggested types, conferences and correspondence with highway officials of many states and cities, and personal inspection of different pavements as laid elsewhere, it was decided that vitrified brick on a concrete foundation * * * would be the most suitable for Ashokan conditions."

The conclusions favorable to the use of vitrified brick for the Ashokan Reservoir paving were reached by the board's engineers after a careful preliminary study of various types of paving. They divided these types into two groups. First. those of low first cost, requiring from the beginning constant, intelligent, detailed maintenance, and occasionally more extensive repairs and replacements. Second, those of relatively high first cost but of a quality to require little or no repairs for a very long time. The method by which they analyzed the relative merits of these two groups is shown in the accompanying table. Upon the results shown by their study, the board's engineers recommended the use of vitrified brick.

Approximately four miles, located mainly on the dam and dikes of the reservoir and on some of the bridges, are now being paved with this material.

ASHOKAN PAVEMENTS—COMPARATIVE COST OF BITUMINOUS CONCRETE AND BRICK.

(Costs are per square yard of pavement, and do not include grading, drainage, fences, curbs, walks, etc.)

	Bituminous Concrete		Brick	
	Contract 151		Contract 152	
(1) Assumed period between resurfacing, years	16 2/3	25	25	50
(2) First cost, wearing surface alone	$1.01	$1.01	$1.67	$1.67
(3) First cost, macadam or concrete foundation	0.43	0.43	0.64	0.64
(4) Total first cost (2)+(3)....	1.44	1.44	2.31	2.31
(5) Interest (4¼ per cent) and sinking fund (3 per cent) 50-year bonds, for (4), or 5.14 per cent total per annum....	0.074	0.074	0.119	0.119
(6) Annual cost of up-keep, maintenance and ordinary repairs	0.06	0.06	0.01	0.01

KOEHRING PAVER LAYING CONCRETE BASE AND CURB, ASHOKAN RESERVOIR PAVEMENTS.

(7) Cost of resurfacing entire pavement, assumed by direct taxation instead of bond issue. See (1).....	1.08	1.08	1.71	1.71
(8) Average annual cost of upkeep and resurfacing, for first 50 years. (6) + Number of renewals × (7).. / 50	0.104	0.082	0.044	0.010
(9) Total average annual cost, first 50 years (5)+(8).....	0.178	0.156	0.163	0.129

The brick pavements are generally 18 feet wide, including a 2-foot flush concrete edge on the one side and a 2-foot concrete gutter on the other. They are not crowned in the center, but slope 3 inches in 16 feet transversely toward the land side of the dike with an additional 2-inch drop in the 2-foot concrete gutter.

Neither pavement nor gutter has any longitudinal slope, but no trouble is anticipated from this, since the exposed situation on top of the dikes should tend to dry the pavements quickly. The drain inlets for surface water are all on the land side of the dike, 400 to 500 feet apart.

As constructed, the width available for vehicular traffic on the brick pavements is 22 feet with an additional four-foot walk between substantial blue-stone guard walls on the edges of the dikes.

The pavements are constructed upon a 5-inch concrete foundation and a 1½-inch sand cushion.

Portland cement grout is used for the filler as specified by the National Paving Brick Manufacturers' Association.

To prevent excessive temperature stresses in the pavement, it is specified that no grouting of the joints shall be done when the air temperature is likely to be below 40 degrees F.

Construction Methods on the Paseo, Kansas City

Military critics have said that the failure of the Germans to reach Paris in their first great drive into France was due not so much to the recognized bravery of the opposing army as to the superb boulevard system around the city, which enabled the French quickly to concentrate their forces at any threatened point. Kansas City, Missouri, in a similar way is preparing for an invasion, not of enemies, but of friends. H. H. Hanenkratt, a well known Kansas City contractor, has just made a ten-foot cut thru an old Confederate fortification in the south part of the city and is tearing up the earth generally thru battle fields in that vicinity.

The Paseo is the great main artery of the city. There are some 400,000 cubic yards involved in this one contract, which is the largest job of the kind in the history of the place. When completed under this contract, the Paseo will be nine miles long. Five miles at the north end already have been built; the Hanenkratt contract will take it to the south city limits.

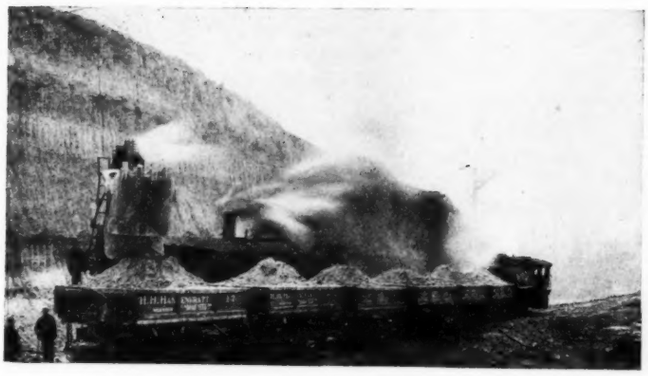
The Paseo has been laid out with a double roadway scheme and will vary in width from 200 feet to 500 feet. Each roadway will be 40 feet wide, the variation being in the width of the intervening parks. This work is on a most elaborate scale. In each block the park will have different treatment, as suggested by the surface of the land, or the art of the designer. In one there will be a sunken garden, in another a concrete pergola, or perhaps a fountain, in some other a ravine will cut thru and its beauties will be preserved for the enjoyment of the people; in others there will be effective arrangements of the shrubbery, water effects, etc.

Feren Brothers, of Kansas City, are sub-contractors, and have a two-machine outfit at work. One is operated by an Emerson-Brantingham gasoline tractor and the other by a 25-h.p. Reeves.

At the south end the Paseo will cross above Seventy-seventh street by means of an ornamental double concrete viaduct. Each viaduct will be 70 feet wide and have a 60-foot span. The two viaducts will be 35 feet apart and steps from Seventy-seventh street will lead up between. The construction of these viaducts has been sublet to Dan Munro, of Chicago. W. A. Keene, of Kansas City, is superintendent.

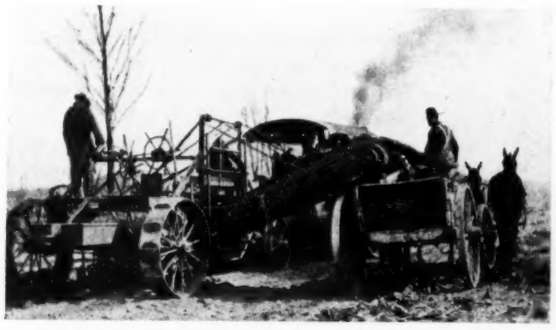
The McMillan Contracting Company have a 325,000-yard contract on which they are busy, building the east end of Meyer boulevard, which connects with the Paseo at Sixty-sixth and Brooklyn and leads up to Swope Park. As it approaches the park entrance this boulevard will be 500 feet

AT THE DUMP. ONE OF THE MCMILLAN CONTRACTING COMPANY'S TRAINS OF FOUR-YARD WESTERN CARS MAKING A FILL IN THE CONSTRUCTION OF MEYER BOULEVARD, KANSAS CITY.



BUILDING THE PASEO. CONSTRUCTION TRAINS OF FOUR-YARD WESTERN CARS AT WORK ON THIS BIG STREET CONTRACT IN KANSAS CITY.

LOADING FOUR-YARD WESTERN CARS WITH BUCYRUS 70 C STEAM SHOVEL, BOULEVARD CONSTRUCTION, KANSAS CITY.



BUILDING THE PASEO, KANSAS CITY. ELEVATING GRADERS AT WORK.

wide. The work involves some 30-foot fills. J. P. Chenier is superintending the job, operating thirty 4-yard Western dump cars, with Vulcan dinkies. The loading is done with a 70C Bucyrus shovel and some splendid yardage records are reported.

The McMillan Company has sublet the team work to Amos & Deen, who have a camp on the ground.

W. C. Mullens has a 93,000-yard contract at the west end of Meyer boulevard; J. O. West, 18,500 yards on Rockhill road; Ed Meegan 70,000 yards on Ward Parkway, which connects with Meyer boulevard at its west end. Mr. West also has just completed 30,000 yards and Mike Haase, 21,000 yards on Benton boulevard; Archie Turner has just completed a 46,000-yard contract on Brookside boulevard.

While the contractors expect to complete the work of grading the Paseo by August or September of this year, it will take three years to complete the paving, Mr. Fred Gabelman, engineer for the Park Board, explained. This is on account of the numerous heavy fills. It will not do to pave them until they have had time to settle thoroly.

A bituminous macadam pavement will be laid, as in all boulevard work in Kansas City, made of native limestone with asphalt filler. The asphalt is poured from a kettle, a process which has proven very satisfactory, altho there is a tendency to get too much asphalt at the point where the pouring begins. Three gallons are put on to the square yard. This pavement is laid on a 9-inch base of hand-sledged rock, as large as 9-inch stones being used, covered with three inches of small stones, all heavily rolled, of course. Shortly after the paving is down it is oiled with a light residuum oil, which forms a binder and dust catcher. A light coat of oil is sprayed on frequently to lay the dust. This process has been found to be very effective. One such pavement, Mr. Gableman said, has been down five years without costing one cent for maintenance, except the cost of oiling to lay the dust. The first cost of such paving, averaging about $1.25 per square yard, is paid by the abutting property, also the curbing and sidewalks. The grading cost is paid by a special tax on the district benefiated, which is one-half block on each side in platted property and 150 feet in unplatted property. After the improvement has been completed, the assessor sets a value on each lot in the benefited district and the cost of the improvement is then apportioned. The plans for the Paseo are so elaborate and construction work so heavy, it was found desirable to set aside a special benefit district, varying in width from a quarter of a mile to one mile.

For maintenance the city makes an annual levy of two and one-half mills on the land value. There also is a special levy for maintenance of ten cents per front foot on boulevards and parkways. For maintenance the city is divided into districts and the money raised in one district must be spent in that particular district.

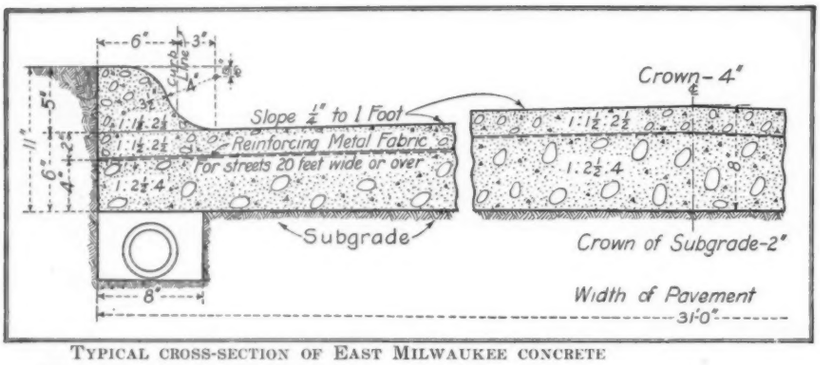
Two large paving contracts recently were let in Kansas City: Swope parkway, from Fifty-ninth to Sixty-seventh street, to the Halpin-Dwyer Construction Co., and Belmont avenue, from Gladstone to St. John, to James O'Conner & Son. The board is getting ready to let two large grading contracts, one of 130,000 yards, including a reinforced concrete bridge on the east end of Linwood boulevard, and the other, 150,000 yards on Van Brunt boulevard. It will take several months to get the preliminary court proceedings out of the way, which probably will delay the letting until next fall.

An amendment to the city charter, secured in 1895, gives the city the right to condemn property for street and boulevard purposes, and the wonderful development which is making Kansas City one of the most beautiful cities in America, may be said to date from that year.

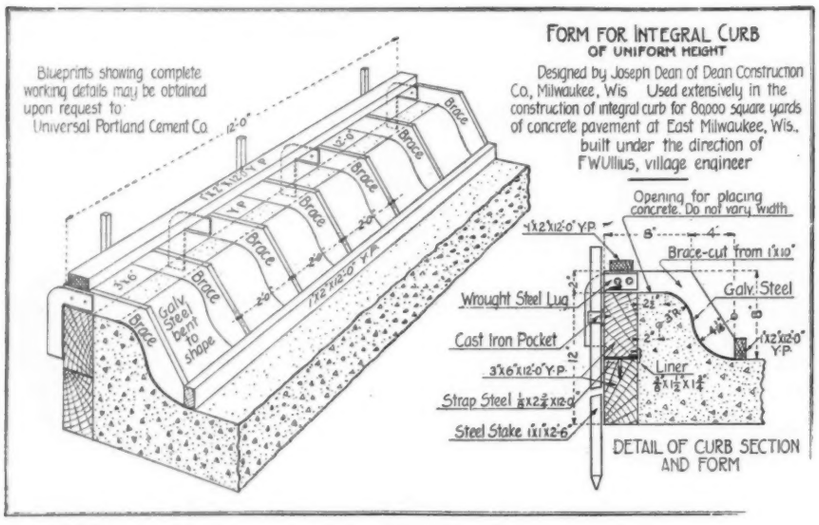
The Use of Integral Curb in East Milwaukee, Wis.

Use of integral curb in connection with concrete street paving saved $3,800 for the taxpayers of East Milwaukee, Wis., in 1915 and will save nearly as much in the 1916 work, according to the village engineer. These are substantial items per capita, for the total population of East Milwaukee is only 1,450. Concrete pavement built last year totals 89,000 square yards, an amount which in proportion to the population, probably exceeds that laid in any other municipality.

Prior to 1913 the only street improvements in East Milwaukee were those constructed under private contract by real estate men. The laws of Wisconsin did not permit villages



TYPICAL CROSS-SECTION OF EAST MILWAUKEE CONCRETE PAVEMENT WITH INTEGRAL CURB.


FORM FOR INTEGRAL CURB
OF UNIFORM HEIGHT
Designed by Joseph Dean of Dean Construction Co., Milwaukee, Wis. Used extensively in the construction of integral curb for 80000 square yards of concrete pavement at East Milwaukee, Wis., built under the direction of F.W.Ullius, village engineer
Blueprints showing complete working details may be obtained upon request to Universal Portland Cement Co.
Opening for placing concrete. Do not vary width
Brace-cut from 1"x10"
Galv. Steel
Wrought Steel Lug
Cast Iron Pocket
Liner
Strap Steel
Steel Stake
DETAIL OF CURB SECTION AND FORM

INTEGRAL CURB ON CONCRETE PAVEMENT WITH 7.3 PER CENT GRADE, MARYLAND AVENUE, EAST MILWAUKEE, WIS.

to improve streets by grading, paving and constructing curbs and gutters without a petition of the owners of a majority of the frontage, nor to do all necessary underground work except with the consent of all the abutting owners. The adjoining owners either absolutely refused to petition for improvements or could not agree upon the type of pavement to be used. It was found practically impossible to get the consent of all the abutting owners to the installation of all necessary underground work, which meant that even if streets were paved, the process of tearing them up for the installation of underground work would immediately follow the construction of the pavements. East Milwaukee was not satisfied with these conditions. Its representatives, headed by the village attorney, G. H. Gabel, generously gave their time in attempts to have the legislature revise the laws to permit villages to pave streets and do all underground work without the petition or consent of adjoining owners. Success was finally attained and villages thruout the state are indebted to East Milwaukee for the progress made.

As soon as the laws permitted, East Milwaukee started in earnest to make permanent improvements, including underground work, grading and sidewalk construction. The recent passage of these laws accounts for the large yardage of paving constructed last year and to be constructed this year.

The first concrete pavement constructed by the village was laid on Richland avenue in 1913. An illustration of this, photographed this year, accompanies. The excellence of this work resulted in the selection of concrete for the paving of Frederick street in 1914. In 1915 the village laid 80,000 square yards of concrete. This constituted all the paving work for the year, except 300 yards of another type which was laid to finish an uncompleted block.

One of the contractors, the Dean Construction Co., Milwaukee, used a curb form practically the same as that shown herewith. The principal difference is that East Milwaukees' curb is only 5 instead of 6 inches high. This form proved so successful that the engineer specified its use by all other contractors doing work in East Milwaukee.

As soon as the pavement is struck off, the form is set in place and any tendency for it to rise when concrete is placed behind it is overcome by placing at 12-foot intervals along the form, worthless cement sacks half-filled with sand.

Most of the East Milwaukee work is two-course construction with a base-course of a 1:2½:4 mixture and a top course of a 1:1½:2½ granite mixture. That portion of the integral curb extending above the pavement is made of the same mixture as the top-course of the pavement. All pavements over 20 feet wide are reinforced.

The following clause from the specifications shows that the village engineer appreciates the folly of using bank-run mixtures: "Mixed Aggregate Crusher run stone, bank run gravel or artificially (commercialy) prepared mixtures of fine and coarse aggregate shall not be used." In general, the specifications for the concrete pavement as well as for integral curbs follow those recommended by the American Concrete Institute in its standard "Specifications for Concrete Roads, Streets and Alleys."

The village constructed concrete sidewalks on practically all the streets where paving was done and will continue this practice in 1916.

Contracts have been awarded for this year's work as follows:

To Froemming & Retzlaff, Milwaukee, for 2,081 square yards

on Cramer street and 3,427 square yards on Kensington boulevard; to Dean Construction Co., Milwaukee, for 10,765 square yards on Farwell avenue; to Milwaukee General Construction Co., Milwaukee, for 6,895 square yards on Stowell place; to J. H. Donahue, Milwaukee, for 4,693 square yards on Menlo boulevard; to J. Donahue, Milwaukee, for 7,232 square yards on Marion street, and 1,620 square yards on Jarvis street.

Practically all the work constructed by the village has been in charge of F. W. Ullius, Jr., a graduate in civil engineering of the University of Wisconsin. Mr. Ullius spent several years as inspector of dredging for the United States Government at Oconto, Wis., as detailer for the Milwaukee Bridge Co., Milwaukee, and as instrument-man for the Chicago, Milwaukee & St. Paul Railway. He has been village engineer of East Milwaukee since 1913.

Economies of By-Product Coke

In years gone by the surplus gas available from by-product coke ovens was guaranteed by oven builders to be 5,000 cubic feet per ton of coal coked, with 500 B.t.u. Modern plants yield 6,250 to 6,600 cubic feet surplus gas. This, of course, is only possible where air is absolutely excluded, as leaks would prevent any such results.

The oven size has gone from a capacity of 4.5 tons of coal to 13.5 tons, which seems to be about the standard. While it varies with different coals, an oven is generally about 17 to 22 inches wide, with a taper to facilitate pushing the coke. The height of the oven is about 10 feet and the length from 35 to 40 feet.

The cost of ovens has increased from about $7,500 to nearly $20,000 per oven. This is easily explained by the increased weight of the materials entering into the construction, and the fact that the maintenance and conversion cost has been cut to well below 60c per ton of coal coked. Taking as an example coal around 28.5 per cent. volatile matter, with the ordinary yield a typical balance sheet for a 100 oven plant of 13.5 tons per oven capacity on an 18-hour coking time would be as follows, according to T. C. Clarke before the Society of Chemical Industry:

Daily Expenditure.

1,766 tons of coal, at $3 per ton	$5,298.00
Conversion cost, including depreciation, contingencies and all charges, except interest and administration; 60c per ton	1,059.60
Interest on investment of $2,000,000 at 5% $100,000= 22c per ton of coke, 1,236 × 22	271.92
	$6,629.52

Receipts.

Tar, 7 gal. per ton of coal, at 1½c per gal	$ 309.05
Sulphate, 1% at $60 a ton	1,059.60
Gas, 6,000 cu. ft. at 10c	1,059.60
Benzol, 2¼ gal. at 14c, or 20c less 6c conversion	556.29
Toluol, 0.3 of a gal. at 15c. per gallon	79.47
	$3,064.01

This makes the cost of coke $6,629.52—$3,064.01=$3,565.51 for 1,236 net tons, a yield of 70 per cent., or $2.88 per ton. So you have a ton of coke for less than the ton of coal cost you, and have 10,500,000 cubic feet of surplus gas of 550 B.t.u. at 10c per 1,000 cubic feet and a uniform coke both physically and chemically, with depreciation and interest taken care of.

At present war prices owners of by-product coke ovens selling their benzol at 50c per gallon and their toluol at $4.50 per gallon, find their coke costs them nothing.

Benzol as a Motor Fuel.

With the exception of the Semet-Solvay Company, the benzol industry is in its infancy. Plants are being built in practically every coke-oven installation since the war began, but the result after the war remains to be seen. Logically the first and greatest market for benzol will be as motor fuel.

Assuming the capacity of the old-type ovens at 5 tons of coal per day of 24 hours, and the larger ovens at 15 tons and getting a yield of 2½ gallons of 50 per cent. benzol per ton, we find the benzol production should be 84,900,000 gallons, or 2,694,000 barrels per year. Fear has been expressed that the sudden dumping on our markets after the war of 85,000,000 gallons of motor fuel would break the price badly and make a number of lean years for the coke-oven-benzol producer.

If 200,000 of the 300,000 Ford cars produced annually remain in this country, and have an average mileage of 5,000 per car and consume a gallon of gasoline for every 15 miles, their annual consumption will be 66,666,000 gallons. Since the benzol output, if all sold for motor spirits, only amounts to 84,990,000 gallons, and one make of car uses 66,666,000 gallons, with the increase in automobile production that the statistics show, it seems we are fortunate to have a new fuel coming on the market.

The production of tar in gallons in 1905 was 36,379,000; in 1910, 69,780,000 gallons, and when the various plants now built and building are in operation these figures will advance to 237,947,000 gallons of tar.

Sulphate of ammonia production in 1905 in the United States was 65,000 tons of 2,000 pounds; in 1910, 115,000 tons. When the present ovens now built and building are operating, the production will be about 340,000 tons. The price of these has been 2.5 cents per gallon for the tar, and for the sulphate of ammonia, around $60 a ton for the past ten years.

There are in operation or building 63 by-product coke-oven plants with 8,900 ovens, practically all of them fitted for benzol recovery.

The Factograf Camera

The Factograf Camera is the direct result of the necessity for reliable meter readings. It not only reads the gas, the electric and the water meter with photographic fidelity, but it brings its indisputable record to the office files. In case of a disputed reading, the records are at hand. There is no need to go back and re-read the meter. It records, reliably, the reading of the "peak" on demand meters before they are reset for the next month. It eliminates argument—and does it economically. The meter reader can not only work more accurately with the Factograf than by the old method, but can work more rapidly. And when his record is turned in at the office there can be no doubt as to its being absolutely correct.

The reading is made by placing the front of the camera against the meter dial and pressing downward on the exposure lever. This action automatically turns on the light, opens and closes the shutter and turns off the light. The shutter, with each exposure has been wound into place, when, again automatically, it flies back to the "set" position. This prevents the possibility of a double exposure; that is, the superimposing of one exposure upon another. Likewise there can be no blanks, for the film can not be wound off until the exposure has been made. Winding reel and shutter are mutually inter-locking, thus eliminating the possibility of error from forgetting to turn the key or from turning the key before the exposure has been made.

The exposure is recorded upon a special sensitive emulsion on paper support, recording on a plane 1½x2¼ inches. This special film is supplied in the familiar cartridge form and is, therefore, daylight loading. When the last exposure has been made on a spool of film, the shutter remains locked until a new spool has been inserted.

Cards may be provided with the reader's name, route number and date, which may be placed against the front of camera and photographed to identify the record.

Sanitary Collection of Refuse and Street Sweepings

When the incinerator plan of disposing of the city's wastes is in use, the collection of these wastes should be made in a manner to suit the method of disposal.

Garbage and ashes can be collected together with advantage to both as regards the sanitary conditions of the collection. The ashes absorb the moisture of the garbage and delay, or for the time prevent, its decomposition and thus largely prevent the dissemination of odors common when garbage is collected separately. At the same time the moisture of the garbage allays the dust of the ashes so that there is little or none of the nuisance from the flying of dust which is an accompaniment of the separate removal of ashes.

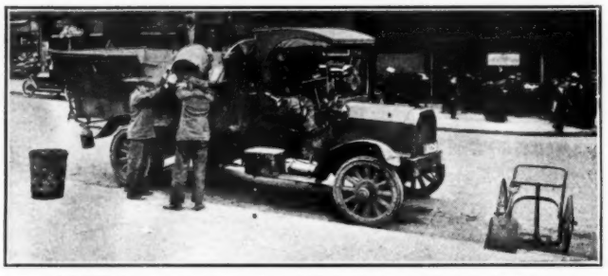
The incinerator may be able to consume the ashes and garbage together, but in this country it seems to be necessary to collect all the combustible refuse in order to obtain fuel enough to consume the garbage in a sanitary manner. It may or may not be objectionable to mix the general combustible refuse with the ashes and garbage according to the method of collection adopted. Even if the combustible refuse is taken to the incinerator to be burned with the ashes and garbage it may be handled separately at the house and tied in bundles according to the fashion in some German cities.

OCHSNER SYSTEM OF REMOVAL OF REFUSE AND STREET SWEEPINGS. NOTE STRICTLY SANITARY CONDITIONS AND FACILITIES FOR LOADING CANS BY SMALL TRUCK ON INCLINED RAILWAY.

At most, the separation of the refuse by the householder need be in no more than three divisions; the ashes and garbage in one can with a tightly fitting cover, the combustible refuse in the bundles mentioned and the incombustible refuse in another can or box.

The Ochsner system from Switzerland prefers to use removable cans for the smaller refuse, such as the garbage and ash mixture, street sweepings, and the like, and to remove them on wagons, horse or motor-drawn, like the one shown in one of the accompanying photographs, leaving clean cans in their places. This system is sanitary in all its details because neither dust nor odors escape at place of loading, or on the way to the incinerator, or even when unloading into the hoppers at the plant.

In contrast with this sanitary can system is the method of removing street sweepings shown in the photograph of an automobile truck used in the street cleaning service of Boston. The bed is high and three men are required to empty a can, two to lift it and one to place its contents in the bed, besides the chauffeur. The bed is open and, so far as its upper extension is concerned, is not dust tight, so that both in filling and in passing thru the streets there must be more or less dropping of material and flying of dust as well as some odor. The appearance of the street surfaces under the vehicles in the two pictures shows the difference between removing tight cans and emptying cans with consequent certainty of dropping more or less of their contents on the street in the operation.



AMERICAN SYSTEM OF DUMPING CANS OF STREET SWEEPINGS INTO OPEN BODY ON MOTOR TRUCK WITH CONSEQUENT DISPERSION OF ODORS AND DUST WHEN EMPTYING AND IN TRANSIT.

We are indebted to Mrs. Flora Spiegelberg, a public-spirited citizen of New York, for the picture of the Swiss wagon and cans. She is spending considerable time and energy in trying to secure the adoption in New York of the desirable zone system of collection with an incinerator in each zone, located conveniently and of the sanitary and inconspicuous nature so common in foreign cities, and of which we have so few examples in this country.

MISCELLANEOUS

The March of Events

August 29-31, at Johnstown, Pa. League of Cities of Third Class in Pennsylvania. F. H. Gates, secretary, Wilkes-Barre, Pa.

September 4-8, at Lexington, Ky. Southern Appalachian Good Roads Association. Joseph Hyde Pratt, secretary, Chapel Hill, N. C.

September 13-15, at Tacoma, Wash. Washington State Association of County Commissioners. J. C. Hansen, secretary, Port Angeles, Wash.

September 18-20, at Philadelphia, Pa. Illuminating Engineering Society. C. A. Littlefield, general secretary.

October 2-6, at Grand Rapids, Mich. Playground and Recreation Association of America. H. S. Braucher, secretary, 1 Madison avenue, New York.

October 9-13, at Robert Treat Hotel, Newark, N. J. American Society of Municipal Improvements. Charles Carroll Brown, secretary, 702 Wulsin Building, Indianapolis, Ind.

October 17-20, at Chicago, Ill. American Gas Institute. Geo. G. Ramsdell, secretary, 29 West Twenty-ninth street, New York.

December 6, at New York. Society of Gas Lighting. Geo. G. Ramsdell, secretary, 29 West Thirty-ninth street, New York.

December 6-8, at Washington, D. C. National Rivers and Harbors Congress. S. A. Thompson, secretary, 824 Colorado Building, Washington, D. C.

December 5-8, at New York. American Society of Mechanical Engineers. Calvin W. Rice, 29 West Thirty-ninth street, New York.

December 26-31, at New York. American Association for the Advancement of Science. L. O. Howard, Smithsonian Institution, Washington, D. C.

January 20, 1917, at Kansas City, Mo. Western Paving Brick Manufacturers' Association. G. W. Thurston, secretary, 416 Dwight Building, Kansas City, Mo.

January 23-25, at New York. American Wood Preservers' Association. F. J. Angier, secretary, B. & O. Mt. Royal Sta., Baltimore, Md.

February 5-9, 1917, at Mechanics' Hall, Boston, Mass. American Road Builders' Association. E. L. Powers, secretary, 150 Nassau street, New York.

Technical Schools

The College of Engineering of the University of Illinois graduated 222 students in June, from 36 to 44 each in architectural, civil, electrical and mechanical engineering and smaller numbers in six other courses.

A committee of the Association of Urban Universities, the chairman of which is P. R. Kolbe, of the Municipal University of Akron, O., is sending to all instructors having supervision of field work of collegiate grade in any department of instruction, a series of questions regarding all the details of the organization and work done as a basis of a report and recommendation as to standards and methods of conducting work of this sort.

Bulletins of the N. Y. State College of Forestry, Syracuse, N. Y., outline A Street Tree System for New York City, Boro of Manhattan, and outline the work of the state forest camp in the Adirondacks, held every year in August.

Civil Service Examinations

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

July 5: Chemists in Ordnance Department, Navy Yard, Washington, D. C., at $3.84 a day.

July 5, 6: Assistant inspector of weights and measures, Bureau of Standards, Department of Commerce, at $1,000 to $1,600 a year.

July 18: Natural gas engineer in Bureau of Mines, Department of the Interior, at $1,800 to $2,500 a year.

July 18: Assistant petroleum engineer in Bureau of Mines, Department of Interior, at $1,800 to $2,500 a year.

July 18: Ordnance draftsman in department of ordnance, Navy Yard, Washington, D. C., at $4 to $5.04 a day.

July 25: Instrument maker at Naval Observatory, Washington, D. C., at $3.84 at entrance.

Personal Notes

A prize of $100 offered by the Barber Asphalt Paving Company to students of highway engineering at Columbia University for an exhaustive study on the "Comparison and Selection of Roads and Pavements," has been awarded Mortimer L. Neinken, of Brooklyn.

O. A. Gierlich is the new city engineer of El Monte, Cal.

Louis Moyer is the new county superintendent of highways of Monroe county, at Seneca Falls, N. Y.

C. W. Cooper is city engineer of Anniston, Ala.

C. R. Crissey has been appointed city engineer of Johnstown, Pa.

Charles Pratt has accepted the position of city engineer of Erie, Kans.

G. N. Wood has been appointed to the vacancy in the city engineership at Chanute, Kans.

E. R. Wells is the new city engineer at San Angeles, Tex.

W. W. White has been appointed superintendent of the municipal light plant of Bolivar, Tenn.

George Brown is the new head of the Aberdeen, Wash., water department.

Karl C. Kastberg is the new city engineer at Des Moines, Iowa.

Robert McCormick is city engineer and water superintendent at Boone, Iowa.

Some charges by a former city employe, later an alderman, of Calgary, Alberta, against Geo. W. Craig, the competent and popular city engineer, have been investigated by the local members of the Canadian Society of Civil Engineers, by authority of the city council, and were found to be without foundation. Mr. Craig is an associate member of the American Society of Civil Engineers, having been in the city engineer's office in Omaha, Neb., in various capacities, including city engineer, for many years before accepting his Calgary position.

C. D. Martin is city engineer of Merced, Cal.

Robert L. Reading has been appointed city engineer of Redding, Cal.

Paul E. Kressly is now the city engineer of Beaumont, Cal., appointed for a second term.

F. J. Mueller occupies the double office of city engineer and superintendent of streets of Corona, Cal.

Sydney Jones has been appointed to fill the vacancy in the city engineer's office of Hayward, Cal.

W. C. Wattles succeeds Geo. N. Adams as city engineer of Hayward, Cal.

G. E. Hill has been promoted to city engineer of South Pasadena, Cal.

S. H. Finley is city engineer of the new town of Seal Beach, Cal.

M. T. Cantell has been appointed city engineer of St. Vital, Manitoba.

Richard Lamb, consulting and constructing engineer, has moved his office to 90 West street, New York.

H. L. Cory has been appointed city engineer of Baker, Mont.

C. C. Fletcher is commissioner of water works and sewerage at Aberdeen, S. D.

Free Articles on City Planning

Mr. Frank Koester, consulting engineer and city planning expert, 50 Church street, New York City, and author of "Modern City Planning and Maintenance," has prepared thirty short articles, newspaper style, covering the various phases of the city planning problems. Mr. Koester is prepared to furnish proofs of these articles free of charge to commercial and civic organizations "for the sole purpose that they be published in their local newspapers and other publications under the conditions that full credit is given to the author of same."

Municipal Lighting Matters in Massachusetts

The first instance of the gas commissioners being applied to for authority, under which a municipal lighting plant may build in another town, is in the case of the Middleboro (Mass.) lighting department, which asked approval of its plan to extend electric lines into the town of Lakeville. The law gives a town the right to make such extensions, merely leaving to the commission the expediency in individual cases. As both the voters and the lighting board were very desirous of making the extension, and since a considerable return is indicated on the necessary outlay, the board readily grants authority in the present case.

The voters of Concord, Mass., at a special town meeting, May 15, decided to retain the local electric generating plant rather than buy energy from an outside source. A special committee appointed in March recommended this course. The town will expend about $10,000 in improving the steam plant.

Co-Operative Collection of Municipal Data

The State Bureau of Municipal Information of the New York State Conference of Mayors and Other City Officials has made a report of its first year of work under a secretary with the work in his direct charge. The bureau has arranged for co-operation with similar bureaus and state offices in other states, secures copies of specially valuable city and state reports for distribution to the mayors of the cities of the state, has collected full information about prices of apparatus, products and service needed by cities, keeps watch of the newspapers and volunteers its services to any municipal officer who is thus found to need data, issues a semi-monthly multigraphed bulletin which is largely an index of its work. Reports have been compiled and printed of special value on garbage and refuse collection and disposal, street cleaning methods and cost, water rates in the state, cost and methods of street lighting in the state. It has made many smaller reports for special purposes on paving, police, salaries of officials, pensions, traffic regulations, water sterilization, and others too numerous to list here.

The state law now authorizes the cities to make the appropriations necessary to support the Bureau, the estimated cost requiring about $500 a year from first class cities, $300 from second class and $150 from third class, of which there are 3, 7 and 48 respectively. All of the first and second class cities and over three-fourths of the third class cities have made their appropriations.

Publications Received

Sixty-Third Annual report of the Board of Water Commissioners of Detroit, Mich., for year ending June 30, 1915. Theodore A. Leisen, general superintendent.

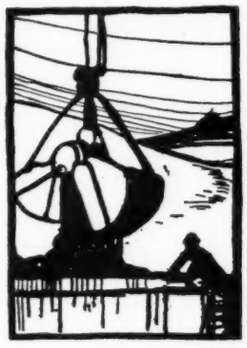
"Industrial Leadership," by H. L. Gantt, is a book of 128 pages containing addresses delivered in the Page Lecture series of 1915 before the senior class of the Sheffield Scientific School, Yale University, setting forth the principles on which the author believes an industrial democracy can be developed and outlining the extent to which the state can safely go in industrial and vocational training. It is published by the Yale University Press, New Haven, Conn., at $1.

Report of Water and Light Department of Duluth, Minn., for 1915. D. A. Reed, manager.

Report of the Board of Public Service Commissioners of Los Angeles, Cal., for year ending June 30, 1915. William Mulholland, chief engineer.

Report of Bureau of Water, Department of Parks and Public Property, Reading, Pa., for year ending April 6, 1914. Emil L. Nuebling, chief engineer.

Surface Oiling of Earth Roads, is the title of Bulletin No. 11, which has just been issued by the Illinois State Highway Department. This publication, which was prepared by B. H. Piepmeier. maintenance engineer of the Illinois State Highing the increased demand for information on this subject. The ing the increased demand for information of this subject. The purpose is not to cover in detail all that might be said in regard to ailing earth roads, but rather to give a general outline of the subject together with suggestions as to the best methods for oiling and maintaining earth roads. The purpose of oiling, the selection and preparation of the roads for oiling and directions for applying the oil are given and the questions of shipping and handling the oil are discussed in some detail. The bulletin gives as many cost data as are available at the present time. A short section deals with application of oil on gravel and macadam roads.



MACHINERY AND SUPPLIES

Removing Calking with Blowpipe

We reproduce a view showing operator removing lead calking of 40-inch main by means of an Oxweld welding blowpipe. With hammer and chisel it usually takes a man a day and a half to remove the lead, with danger of injuring the pipes. The lead was melted out with the blowpipe in an hour and a half. A small tip is used that gets right inside the crevice and the flame is confined to the lead only, without affecting the pipes in any way.

Heretofore it has been quite a serious and difficult problem to remove the lead calking in the joints of water mains when for any reason it was necessary to take out a section for repair or to insert an elbow, tee or other fitting in the line.

This same type of welding blowpipe was also very effectively used in repairing the Loomis street bridge, Chicago. The method of repair adopted was to trim out the damaged holes in the tire-plates until they were fairly regular, and to add on to the track teeth until they would fit the lengthened holes.

The entire eight teeth were built up in eight days at the rate of one tooth a day, at the end of which time the bridge was put back into commission.

One of the remarkable features of this piece of welding was the fact that it was done under abnormal weather conditions inthe open air, at zero weather.

The best evidence of the satisfactory character of the welding factoory work is the fact that the bridge is operating to-day, three years after the work was finished, on the teeth as built up at that time.

This welding blowpipe, as described, is made by the Oxweld Acetylene Company, Chicago.

REMOVING LEAD CALKING ON 40-INCH WATER PIPE WITH OXWELD WELDING BLOWPIPE.

The Mullen Gravel Heater and Dryer

For many years the problem of heating and drying gravel, grit and crushed stone, in relatively small quantities, on the job, has remained unsolved to most contractors and industrial managers. Sometimes the work has been done by sticking a pipe thru a pile of material on the ground and lighting a fire in it; sometimes a flat iron plate has been raised up from the ground on stones and a fire built under that. In either case much labor, fuel, time and patience have been consumed, with surprisingly poor results. The material to be heated and dried was not brought into a proper relation with the fire, and the fire expended most of its energy in an attempt to heat the surrounding atmosphere.

Several small equipments are on the market, but these are either of the drum type, requiring power to operate, or small pan arrangements that embody no efficient principle of heating and have no capacity worth mentioning.

Some years ago a New York City paving contractor engaged on a large granite block paving job, that required hot tar and hot, dry gravel for the joint filling, was having difficulty in following up the pavers with his joint filling. This man suffered so much inconvenience because of his lack of proper equipment for the purpose of heating and drying the gravel that he was forced to give the subject serious thought and study, the result of which is what to-day is used in New York City and known as the Mullen gravel heater.

This machine, of which an illustration accompanies this article, is remarkably strong and simple. The furnace consists of a multiple perforated sheet of heavy metal bent over roof-like to form the two heating sides. In cross-section it resembles an inverted letter V. At the ends of this multiple sheet are two solid end plates, in one of which is a fire door, and to which also fasten the multiple perforated flights, that are arranged down the sides of the furnace to form the heating chambers, and the hopper that is arranged above the point of the furnace.

The perforated flights are about 3 inches removed from the furnace sides at their bottoms and about 5 inches removed at their tops, causing the gravel that passes under them to do so in a layer averaging about 4 inches in thickness. The hopper discharges on both sides of the furnace under the topmost perforated flight on either side, having two 5-inch openings separated by the point at the top of the furnace.

A smokestack is arranged at the top of the furnace for starting the fire, and grates, wheels, ash pans, hot gravel pans, etc., are arranged at the bottom in quite the usual way.

But one man is required to operate the machine. He tends the fire, shovels cold, wet gravel into the hopper, and shovels hot, dry gravel away at the bottom into wheelbarrows, to be taken to the men at work, and he does not work overtime. As he removes the hot, dry gravel banked at the base of the machine, the gravel from the hopper gravitates freely down over the multiple perforated furnace side and under the multiple perforated flights until it is again banked at the base.

It is surprising what a small amount of fuel is required to heat and dry a large amount of gravel in this machine; but when one sees the actual construction of the machine and observes that practically all the heat from the fire passes out thru the multiple perforations in the furnace sides, thru the voids of the gravel or stone, and then escapes either thru the spaces between the flights or thru their multiple perforations, this efficiency of fuel is readily understood.

The machine shown in the illustration has a capacity of about four tons of gravel per hour, or forty tons per ten-hour day.

The temperature of the hot, dry gravel can be regulated by the length of time that it remains in the multiple perforated heating compartments on the sides of the furnace. It is not difficult to get a large yield of material perfectly dry and heated to about 200 degrees Fahrenheit.

There is also a Mullen combination tar pot and gravel heater, in which the gravel-heating and drying section is built on the same principle. This is used more for repair work along street railway tracks and for patching the tops of bituminous roads.

It is claimed for these machines that they are time, fuel, labor and money savers, and a great convenience besides. It is estimated that they pay for themselves in about three months' use.

The purposes to which these heaters have been put to date are for heating and drying gravel, slag, grit and crushed stone for paving joint filling, roofing, top dressing of bituminous roads, and winter concrete. When concrete must be mixed in cold weather, this heater will bring the stone to a sufficient temperature to heat the sand, cement, and water that must be mixed therewith, and maintain the batch in place sufficiently warm to keep it from freezing before setting. This was done in finishing up a bridge abutment.

The Mullen gravel heaters have been used by the contractors and street railway companies of New York City since 1910. The Third Avenue Railway system has purchased seven to date and the Brooklyn Rapid Transit system has five. Many have been shipped out to contractors who saw them in operation while visiting New York, but to date they have not been systematically marketed.

Littleford Brothers, of Cincinnati, Ohio, who are extensive manufacturers of melting kettles and other contractors' and industrial equipment, have secured from the inventor and patentee, Mr. Charles A. Mullen, of New York City, a license to manufacture and sell these heaters, and will henceforth handle them along with their general line.

Excavation Methods on Large Sewer Contracts

The plans for the construction of the new Union Station in Chicago have naturally made necessary a large amount of incidental work. The readjustment of the present sewer system has constituted a considerable part of this work. In brief, the sewers from the district west of the Chicago river flow into the river thru small sewers running down each street. Because of various conflicts, ten existing outlets are being replaced by three new intercepting and outlet sewers. The contracts for the construction of all three of these sewers were awarded to the W. J. Newman Company, of Chicago.

The largest of the three contracts is now under way. This contract has resulted in a rather complicated piece of work. The sewer itself, which will have a capacity of 500 cubic feet per second, is to carry the flow from the proposed Monroe street relief sewer to be built by the city. This begins at the corner of Monroe and Clinton streets and runs one block east on Monroe to Canal, two blocks north on Canal to Washington and east on Washington, by means of a tunnel, to the river. Between Monroe and Adams on Clinton there is a small brick sewer included in this contract.

The sewer is of reinforced concrete construction. The block along Washington street will be of double compartment section in order to increase the velocity due to the flat grade. On Monroe and Canal streets, however, it is all arched section 12 feet wide and 9 feet high, inside dimensions. The total length is about 1,200 feet, calling for an excavation of about 20,000 cubic yards, not including the incidental work made necessary, which will be described later, which adds 10,000 more to this total.

Before the construction of the sewer itself was started, it was necessary to do considerable preliminary work, as the grade of the street, especially that opposite the present Union Station, had to be considerably raised. This called for the construction of a retaining wall between Washington and Monroe streets on the east side of Canal. The large number of public utilities, such as pneumatic tubes, gas pipes, water

VIEW SHOWING SHOVEL IN EXCAVATION ON CANAL STREET, APPROACHING WASHINGTON STREET.

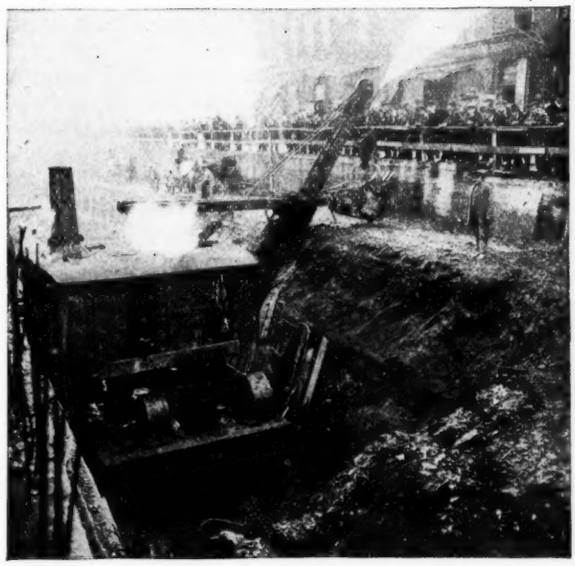
mains and the like, required, in addition to this, the construction of a public utilities gallery along the west curb line of the street. This gallery was of concrete box construction. The contract for this was partially under the Union Station Company and partially under the city. The block between Madison and Washington was dug in part by a revolving shovel, but the obstructions, such as telegraph and trolley poles and the like, made it necessary to do the greater part of this work by hand. The block between Madison and Monroe was also done mostly by hand. In order to keep the roadway open for traffic, a temporary roadway of planks supported from below was built. It was necessary for this roadway not only to carry the traffic of Canal street, but the dump wagons which served the shovel used to dig the sewer. The total excavation for the public utilities gallery amounted to 1,083 cubic yards.

The excavation for the trench in which the retaining wall was placed was also a bothersome problem. This called for the excavation of 6,280 cubic yards. The wall is to be 19 feet high. Between Madison and Washington streets the trench

THIS VIEW GIVES AN EXCELLENT IDEA OF THE METHOD OF MIXING AND TRANSPORTING THE CONCRETE FROM A CENTRAL PLANT. THE MIXED MATERIAL IS CONVEYED FROM THE 175-FOOT TOWER OF LAKEWOOD DESIGN, THRU 400 FEET OF STEEL SPOUTING, TO A WOODEN HOPPER HERE SHOWN, FROM WHICH IT IS TAKEN IN CONCRETE BUGGIES TO THE SEWER, INTO WHICH IT IS DUMPED THRU THE SPOUTING SHOWN IN THE FOREGROUND.

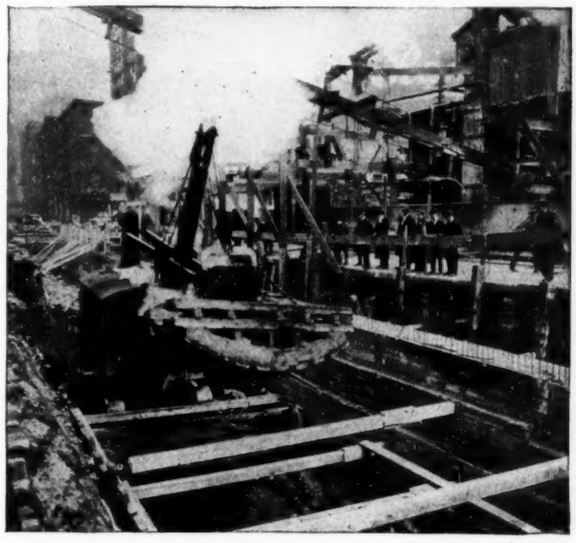
was first dug about 11 feet deep and 14 feet wide, by a revolving shovel. The piles which form the foundation for the retaining walls were then driven to grade by means of followers. The remaining excavation was done by hand and the material thrown off to the side in the portion of the trench already excavated. Between Madison and Monroe streets the excavation was also done by hand. The material was loaded into a bucket which was handled by a Bucyrus revolving shovel acting as a crane with its dipper and dipper handle removed. Considerable care had to be taken on this portion of the work, inasmuch as the tubes and pipes mentioned before had not been moved into the new public utilities gallery which was then under construction.

The digging of the sewer itself is being done by the open cut method with the 18-B Bucyrus revolving shovel above mentioned. This machine is equipped with a ⅝-yard dipper and a dipper handle 30 feet in length. Some trouble was experienced along Monroe street, owing to the amount of water encountered, which made necessary the use of a Novo gasoline pumping outfit in order to keep the trench sufficiently dry for operation. The excavated trench was sheeted with 2 by 12-



NOTE THE HEAVILY CONSTRUCTED PLATFORMS OR FLOATS ON WHICH THE SHOVEL IS OPERATED. THESE PLATFORMS, AS MAY BE SEEN, ARE SHAPED TO THE BOTTOM CONTOUR OF THE TRENCH. SEE ALSO THE NEXT PHOTOGRAPH.

inch timbers with heavy wooden trench braces. The excavation of the Canal street section is practically completed. Our photographs give a very good idea of this portion of the work. During the winter, considerable heavy frost was encountered, which increased the difficulty of the digging. The depth of cut varied considerably between Madison and Monroe streets, running as deep as 20 feet with a bottom width of 18 feet. As the excavation approached Washington street, however, the depth ran up to about 17 feet 10 inches. In the block between Madison and Washington streets, as before stated, the shovel had already proceeded, taking out a portion of the material. The Bucyrus removed the remainder to grade. The material was at all times heavy to dig, consisting of a tough clay. Part of this was used for back-filling and part was hauled in wagons to various parts of the city. The problem was further complicated by the fact that it was necessary at all times to keep the street open as far as possible, especially that section between



MOVING UP. THE SHOVEL LIFTING ONE OF THE PLATFORMS INTO PLACE. NOTE HOW FEW MEN ARE NECESSARY IN ORDER TO ACCOMPLISH THIS.

Madison and Monroe streets, as stated before. This, of course, cut down the speed of advance.

As shown in our views, closely following the shovel forms were placed for the construction of the concrete sewer. The shovel thruout the work instead of digging the trench from a platform which straddled it, as is generally the custom, was operated in the bottom of the ditch. In order to be able to load the wagons easily, the machine was operated on a heavily constructed series of floats, the construction of which can be understood better by referring to the last two of our photographs. The bottom part of these floats was shaped to the contour of the bottom of the ditch. In order to move, these sections were chained, the chain being thrown over the teeth of the dipper and were lifted and placed in position by the shovel, as may be seen in the last of the accompanying photographs.

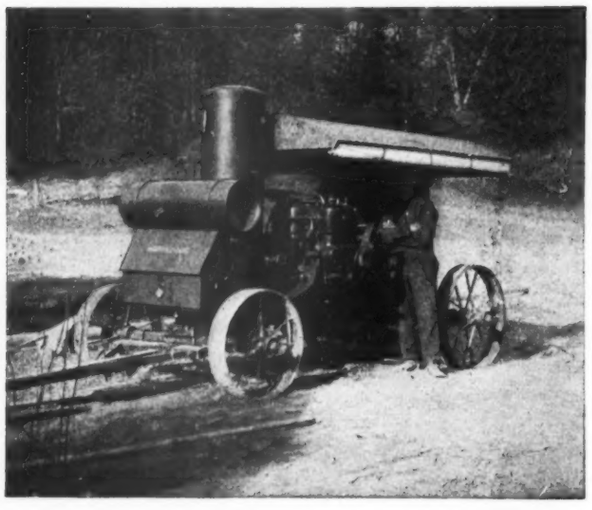
Portable Air Compressors

For many kinds of construction work, where the installation of permanent equipment, with its accompanying pipe lines and auxiliary appurtenances, would be both inconvenient and expensive, the employment of portable compressors has resulted in savings of considerable magnitude.

Thruout the work of laying gas and water mains, compressed air will be found useful for operating heavy chipping hammers of the pneumatic pick type. After the upper layer of asphalt or bitumen has been removed, it is often necessary to drill thru underlying concrete or rock for removal by blasting or wedging. For lowering pipe into ditches a small air hoist saves time and labor. After the laying of cast iron pipe, calking hammers are put to work calking the joints with lead wool, this type of joint having been demonstrated as quite durable and satisfactory. In the laying of large riveted steel water pipe, drills and riveters, rivet forges and holders-on can be used for reaming holes and riveting the steel pipe and calking hammers for calking seams and rivets.

When the work has advanced to the stake where the trench is ready for back filling, a rammer will be found expeditious and efficient for tamping down the dirt and putting on the finishing touches. This eliminates annoying settlements of pavement. On completion of the work, the whole pipe line can be tested by means of compressed air supplied by the portable outfit.

On road work the portable air compressor furnishes a complete power plant for rock drilling, which can be moved along as the work progresses.



IMPERIAL PORTABLE COMPRESSOR.

The added speed of construction with such equipment should effect savings which would go far toward paying for the compressor and drills.

Road cuts thru a rock hill, and the excavation of rock for crushing, require heavy drills, capable of putting in comparatively large, deep holes. This is the field of the tripod rock drill in road work.

For ditch work, breaking up boulders, drilling ledges and trimming rock cuts, drills have now almost entirely taken the place of other tools, one of their chief advantages being small air consumption, making the use of a small and comparatively light portable compressor possible.

The cost of drilling ledges and boulders in trench work in cities near Boston, using both air drills operated by portable compressors, steam drills, and hand methods, showing the following results:

Hand drilling cost per cu. yd. excavated (standard rate for this district)	$4.00
Steam drilling cost per cu. yd	.96
Compressed air drilling cost per cu. yd	.80

The compressed air outfit can be operated by labor unfamiliar with it, while the ease and efficiency of operation of the compressed air drill make it ideal for this class of work.

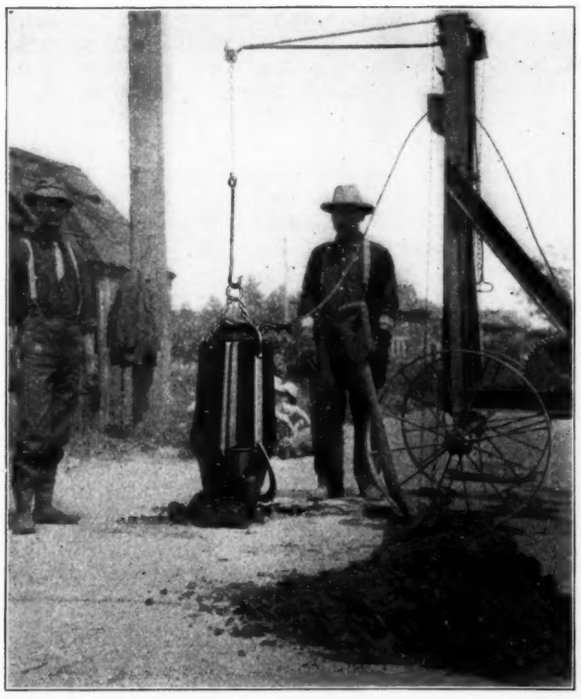
The illustration shows a view of the Imperial portable air compressor, as manufactured by the Ingersoll-Rand Company. This compressor is of the standard Imperial XII duplex type. The engine is a four-cylinder long stroke tractor type, capable of a considerable overload. It is connected to the compressor thru the Imperial short belt drive and a leather-faced coned clutch. The frame is of steel of very substantial construction and mounted on steel wheels. A gasoline tank of 25 gallons capacity and a large air receiver, fitted with safety valve, pressure gage, drain cocks and outlet valves, and a substantial cover with curtains are included as part of the complete outfit. The entire equipment is complete and the necessary gasoline and oil put it in shape for immediate use. It is light and easily moved from place to place and it runs so smoothly that no blocking is necessary.

Kuhlman Sewer Cleaning Machine

The accompanying illustration shows a view of the Kuhlman sewer cleaning machine, as operated by the city of Gary, Ind.

This machine, which was invented by Mr. John F. Kuhlman, commissioner on Board of Public Works, Hammond, Ind., consists of a series of patented expansion buckets for the cleaning of sewers 8 inches in diameter and upwards. "The bucket," states Mr. Kuhlman, "is not necessarily drawn from one manhole to the other, but is only drawn into the sewer far enough to be filled with the deposit and when full it is drawn back out of the same manhole in which it is inserted, for the bucket is so constructed that when the reverse pull is made, the jaws close up tight and hold anything that may have entered the bucket in its forward movement. Therefore, time is saved when the deposit is near the manhole by reversing the pull the shortest distance to the manhole. Then again, the manhole trolley jack is so arranged that the buckets will slide up out of the sewer without the cable cutting into the sewer or brick work. When the bucket strikes the arm, it releases a hook and guides the bucket to the center of the manhole and up to the surface."

The trolley jack attached at the bottom of the manhole is a special contrivance and has an arm pivoted at the upper end with a cable wheel attached at the lower end, holding the cable down and away from tiling or brick work while the cable is pulled. As soon as the bucket reaches this arm, it swings out to the center, allowing the bucket to come out of the sewer and up thru the center of the manhole without obstruction. This



arm is then automatically locked in an upright position, to be released when the bucket is returned to the sewer and again catch the cable in its lower position. This jack is held firmly in position by being forced against the sides of the manhole with expansion screws. In manholes that are of equal size, this device can be easily and quickly removed by a pull on the chain on the shoe side.

This system, which is manufactured by the Champion Potato Machinery Co., Hammond, Ind., consists of the following: Two steel trucks with hoist windlass and swinging loading boom; two patented trolley jacks for guiding the cable and buckets in manhole; two ⅜-inch wire cables 300 feet long; one each, 6-inch, 8-inch, 12-inch, 15-inch and 17-inch patented expansion buckets, and one 10-foot hand hook.

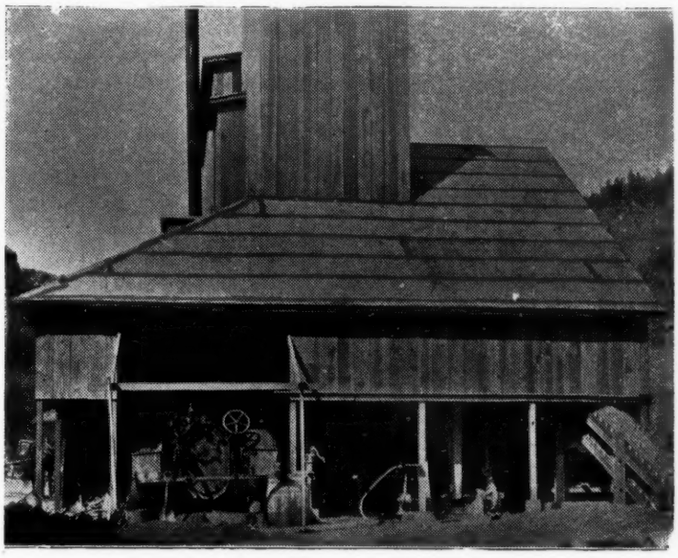
Portable Washer for Aggregate

We are illustrating a No. 4 Stocker concrete material washing plant of approximately 24 tons capacity per hour. This type of plant is run with a 13-h.p. engine. The feature of this plant is that all the material is perfectly clean and carries enough water to keep the ¼-inch screen from clogging. This would otherwise be impossible, as some gravel contains about 15 per cent. clay and about 50 per cent. torpedo sand.

First the gravel is hauled with wheel scrapers and dumped into a hopper under a dump bridge, from which it feeds upon a conveyor and is carried to a 3-inch grading screen over the washer. From the washer it is discharged into an upright elevator, which carries the gravel to a rotary screen which divides it into ¼-inch, ⅞-inch and 1½-inch perfectly screened material, which is deposited into four concrete bins.

The makers of this plant, the Stocker Concrete Material Washer Co., Highland, Ill., are also marketing a simple and portable washer especially intended for cleaning and grading material on small jobs where the washing must be done near the work. This washer consists of a steel drum about 30 inches in diameter and 8 feet long, having cast-iron heads, which rest on rollers. The drum is revolved by a sprocket chain that passes around one of the drum heads and over a pinion geared to a shaft which may be belted to a 2-h.p. engine or motor. The drum runs at about 6 r.p.m. To the shell of the drum are riveted horizontal angles to which steel plates, or shelves, are attached. Within it also is a series of inclined chutes of spiral form. These are adjustable and can be shifted to any desired angle, according to whether the material contains much or little foreign matter and must be passed thru slowly or rapidly.

The drum is partly filled wth water, which enters at one end. The gravel is delivered to a feed hopper (at the opposite end from the water feed) and falls to the bottom of the drum. The horizontal ribs in the drum carry the gravel up



STOCKER CONCRETE MATERIAL WASHING PLANT.

until it drops into the first chute, by which it is delivered a little farther forward and dropped into the water, to be again carried up and dropped into the next chute. As the gravel moves forward, it meets cleaner water, and by the time it reaches the end of the drum the washing is completed. The washed product may be delivered to a screen attached to the drum, or to a conveyor or storage hopper.

White Tractors and Squad Wagons

The fire department of Chicago recently placed an award for three more four-wheel White tractors, as well as three White motor squad wagons.

The White tractor requires no changes in the frame of the ladder truck or turn table. The front wheels and tongue are kept in the quarters where the tractor is used and if the tractor meets with an accident, or has any trouble, by using two jacks and lifting the king bolt, the horse-drawn wheels and horses can be put back on. This is very beneficial where a village or town only has one truck and cannot afford to put it out of service for any kind of repairs.

Each of the three White squad wagons carry the following equipment: An outfit for cutting steel plates or iron bars with flame; one pulmotor; two helmets for use in places where gas or ammonia leaks are found; one 20-ton jack; one life net; one 20-foot extension ladder; eight axes; eight pike poles; two large hand pumps; hammers, mauls, saws, etc.

These machines will be equipped with Lee puncture-proof tires, single front and dual rear.

Cutting Pipe in the Trench

We are illustrating a No. 7 Strickler ratchet pipe cutter at work in the trench. The cut on this pipe, which measures 20 inches in diameter, was made in 35 minutes time. This machine, type No. 7, as illustrated, cuts any pipe 16 to 24 inches in diameter inclusive, and weighs approximately 250 pounds. "This style cutter," states the contractor, "cuts 24-inch pipe as fast as is possible to cut 12-inch pipe by other methods.

"The machine adjusts itself to the different sizes of pipe quickly and accurately and is possible of operation in tight places. It is automatic in operation. The machine opens wide on a strong hinge, permitting it to be placed around the pipe while in the trench, and is instantly put in place and fastened together by tightening the swing bolt.

"The guides which hold the machine in place on the pipe are equipped with hardened tool steel rollers which permit the body of machine to rotate about the pipe with remarkable ease. The yoke which holds the handle is equipped with dogs which engage the teeth on the body of the machine, and the body is rotated around the pipe by merely 'pumping' the handle. The operator can do this from any position he desires. The body rotating about the pipe causes the cutting tool to cut out its own path around the pipe, and the feeder sends the cutting tool in automatically; and this is done with so little labor that one man can quickly cut 8-inch pipe and three men cut 16 and 20-inch cast, wrought, or steel pipe.

"The following types are operated to cut the following diameters of pipe: No. 1 cuts ¾ to 2 inches; No. 2 cuts 1¼ to 4 inches; No. 3 cuts 2½ to 6 inches; No. 4 cuts 4 to 8 inches; No. 5 cuts 8 to 12 inches; No. 6 cuts 12 to 16 inches; No. 7 cuts 16 to 24 inches; No. 8 cuts 24 to 30 inches, inclusive.

This type of ratchet cutter, which is made by W. W. Strickler & Bros., Columbus, O., is used by water works and gas companies, railroads and mines, as well as by municipalities and public works contractors.

Speeding-Up Roller Transportation

The Kelly-Springfield Road Roller Company, Springfield, Ohio, make use of a 3½-ton Kelly truck in conveying rollers to the railroad yards for shipment, as this method results in a great saving of time as compared with driving the roller under its own power.

This method of road roller transportation has been adopted by a number of paving and road contractors specializing in county and state highway construction. Motor trucks, winches and inclined skids render the problem of loading and unloading a comparatively easy matter.

METHOD OF STEAM ROLLER TRANSPORTATION TO SHIPPING STATION AS ADOPTED BY THE KELLY-SPRINGFIELD ROAD ROLLER COMPANY.

The Mathews Gravity Carrier

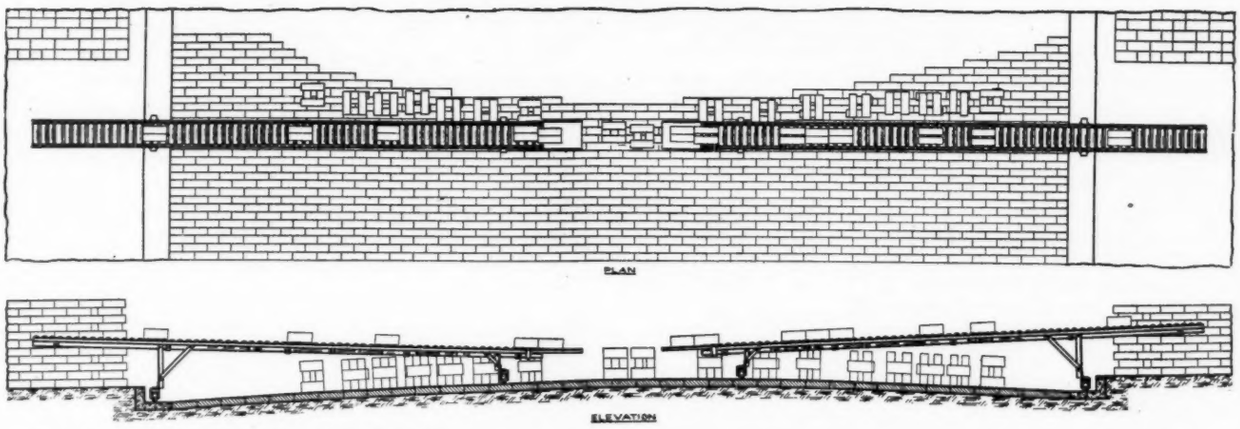
We are illustrating two sections of the Mathews gravity paving brick carrier, as operated by Roehl Bros., paving contractors, Cleveland, O.

Mr. Charles Roehl, of this concern, in explaining advantages of this method, states:

"When we use the 16-foot conveyors we use two men to set the bricks on the carrier and two men as setters, thus using four men to each carrier. While we have these men setting we have two men paving and we manage to lay 45,000 brick per day of 8 hours. By working the old way, it would take two extra men to do the same amount of work, using wheelbarrows.

"Further, we wish to state that another big advantage in operation of the conveyors over wheeling brick is that when wheeling the brick you gouge your pavement and bed full of holes and this costs money to level up. Thus, we find that the big advantages in using the conveyors are convenience, simplicity and style and the saving mentioned."

We are also showing elevation and plan views of two 16-foot sections, as shown in the photographic illustration. The elevation view shows the two sections in place on both sides of a street being paved. These sections are made entirely of steel, the rollers being formed of cold-drawn seamless steel tubing with improved, patented ball-bearings. Caster supports are provided which permit the sections to be rolled along on the new-laid pavement in the rear of the droppers. The support at the upper, or loading end, is set in a distance of 4 feet, which permits the conveyor to extend out over the curb, bringing it within convenient reach of the brick piles. On the lower, or discharge end, a detachable receiving apron is provided which prevents the brick falling off and keeps the line of brick in check in case the conveyor is full. Sixteen-foot sections are generally used on all streets from 24 to 32 feet



TWO 16-FOOT SECTIONS, MATHEWS GRAVITY CARRIER, AS OPERATED BY ROEHL BROS., CLEVELAND, O.

wide. They are made in any desired lengths. These conveyor sections, which are made by the Mathews Gravity Carrier Co., Ellwood City, Pa., are built on a grade of 4 per cent—a fall of ¼ inch to the foot. On this grade the brick travel by their own weight gently, without injury or danger of falling off.

All sections are made 8 inches wide, and each roller is provided with flanges at ends, rising ¼ inch above surface of roller. These flanges act as a guard rail, but do not produce friction, because they are a part of the roller and revolve with it. Axles are full length, extending clear thru the rollers, the ends terminating in the side rails and securely fastened by means of a full-length lock bar. This method of handling brick is endorsed and recommended by the National Association of Paving Brick Manufacturers.

A majority of the prominent contractors in states where brick paving is carried on extensively are using this method in preference to wheeling the brick. It can also be used for unloading cars into wagons or trucks, at a substantial saving in labor and time. The Mathews Gravity Carrier Co. will be pleased to send their Bulletins Nos. 3 and 4 to any contractor who may be interested.

Artificial Leather for Book Binding

With the increased shortage of hides, users of leather are looking to other quarters for material that will take its place. Artificial leather is proving especially satisfactory for automobile, furniture and railway car upholstery. During the last few months it has been used extensively for book-binding. It is answering the purpose, and standing the strongest tests.

Book-finish Fabrikoid is entirely different from any material heretofore offered. It is the result of a practical binder's experience, who made a careful study of the subject, as well as the manufacturing process. The book-binding process of manufacture is different from that used for other grades of any other artificial leather.

Some of its advantages and features are, that it has the leather effect in any grain or color, and costs less, comes in rolls and thus eliminates waste in cutting, no unused corners or edges. It has just the needed degree of pliability, not too soft to work well in a case-making machine, nor too hard to

TWO 16-FOOT SECTIONS, MATHEWS GRAVITY CARRIER, AS OPERATED BY ROEHL BROS., PAVING CONTRACTORS, CLEVELAND, O.

stand the bending of the joints. It is waterproof and washable. This is a strong point, for books naturally get dirty, but if bound in Fabrikoid the covers can be washed. Besides it is vermin-proof, and cannot be destroyed in that manner.

It is made in several grades so that any kind or size book can be bound in it. Some of the largest bookmakers, blank book and loose leaf manufacturers have adopted it. They find that it can be used for work for which artificial leather would have been thought impossible but a short time ago. The Du Pont Company, Wilmington, Del., have issued a neat little booklet that covers the subject fully, which is sent upon application .

Hex Blocks on Chicago Bridge

The accompanying view shows laying of Kreolite Hex blocks on the State street bridge, Chicago.

This material was furnished by the Jennison-Wright Co., Toledo, O., to the Chicago Surface Lines for use inside their tracks, and was approved by the Chicago bridge engineer, who wanted a block that could be nailed to the sub-base, and also one that would automatically take care of any expansion that might occur.

According to the chief engineer, Chicago City Railways Co., "hexagonal paving blocks were used for two reasons: First, to avoid most of the expansion troubles, since each block is the entire log of wood and hence is subjected to radical expansion only, which is about one-third as much as the tangential expansion of the rectangular block; second, each block is 100 per cent. heartwood and so can be face-nailed to the sub-planking without the block cracking. This is necessary on a bascule bridge in order to hold the pavement when the span is raised. This nailing was tried experimentally on several well dried blocks, and it was found that not only could a 60d wire nail be driven to the head of the nail into the block, but that a follower could be placed on the nail and the head driven clear thru without splitting the block. This is impossible with a rectangular block and was the deciding factor in the selection of the hexagonal type.

These blocks are 3½ inches in depth. One advantage of the Hex block is that, because of their shape, they have more body than a rectangular block, and for that reason a 3½-inch Hex block will withstand as much hard wear as will a 4-inch rectangular block, thus making a saving of a half inch in timber.

The Koehring Hot Mixer

The Koehring hot mixer affords a wide range of mixer utility, as it is designed for asphaltic concrete, rock asphalt, mastic floor work and bituminous and cement concrete.

While it may be primarily purchased for hot work, it is readily transformed into a standard Koehring mixer for cement concrete. This flexibility equips the owner to do a variety of work at the smallest possible investment in special equipment.

Special Heating Device.

The heating device of this machine consists of a two-burner oil furnace and a blower mounted on the mixer frame. Combustion takes place in a brick-lined chamber and the conduit which carries the heated gases into the drum thru the drum opening on the charging side. Heated gases, and air from blower and furnace are injected directly into drum by large hot air flue, the design of which insures perfect combustion of gases before the drum is reached. The flue is lined with the greatest fire-resisting material known, which is easily and inexpensively renewed if it burns out. The gate automatically opens as charging skip rises. In closed position this gate prevents escape of dust.

When aggregates are dried in the drum, the full blast is allowed to enter until the aggregates are dry and mixture is brought to desired temperature, at which stage the hot blast is modified. This feature of heat control secures the utmost efficiency in drying aggregates and bringing material to desired temperature in shortest possible time, and at the same time it is easy to avoid any danger of burning the material.

Drying capacity, of course, is dependent on amount of moisture in the mixture and kind of aggregate. On the average, sand, stone and gravel without excess moisture can be thoroly dried in three to five minutes, heating the aggregate to 300 degrees F. in that time, or to a higher temperature in a longer time.

The bituminous material should be heated in melting kettles, then poured or pumped into the Koehring measuring tank, from which it flows into the drum thru a large pipe.

When lime dust or cement are part of the mixture it is advisable to dry the larger aggregates before adding the finer ingredients. Ordinary mixtures are charged into the drum at one operation of the loading skip. The entire mixture is brought to specified temperature by allowing the full blast from both burners to enter. One burner is then shut off by

KREOLITE HEX BLOCKS ON STATE STREET BRIDGE, CHICAGO.

West Michigan Pike, Petoskey, Mich.
Treated with "Tarvia-B" August, 1915.

A Tarvia County—

WE sent our Mr. Clark to see the Emmett County Highway Commission, to tell them about Tarvia.

There were many miles of macadam roads in Emmett County which were being churned up into dust by automobiles as fast as they were built. Repair work was incessant and expensive.

Our Mr. Clark said, "Paint your roads with 'Tarvia-B', applied rapidly and cheaply from a modified sprinkling cart, and covered with a little sand or stone screening. The Tarvia will act as a tough binder cementing the surface together.

"That tough and slightly-plastic surface thus formed, will be automobile-proof. There will be no dust, no mud and very little wear. The coating can be renewed at small expense and the saving on maintenance will more than pay for the Tarvia. The use of Tarvia won't increase your road expenses—it will reduce them and give you better roads besides."

So Emmett County bought a tank car of "Tarvia-B", and tried it on the above road.

October 1, 1915, we received this letter:

I wish to say that the tank car of "Tarvia-B", purchased through your man Clark, is doing everything and more for our roads than he claimed. The Board of County Road Commissioners are trying to arrange to use it on all of our improved county roads in Emmett County next year. Charles W. Lempke,
Emmett County Highway Comr.

On March 23, 1916, the Emmett County Commissioners signed an order for 50,000 gallons of "Tarvia-B" to be used on their macadam roads this year.

There is a grade of Tarvia and a Tarvia process for every macadam road problem.

Booklets free on request. Address our nearest office.

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems.

The advice of these men may be had for the asking by anyone interested.

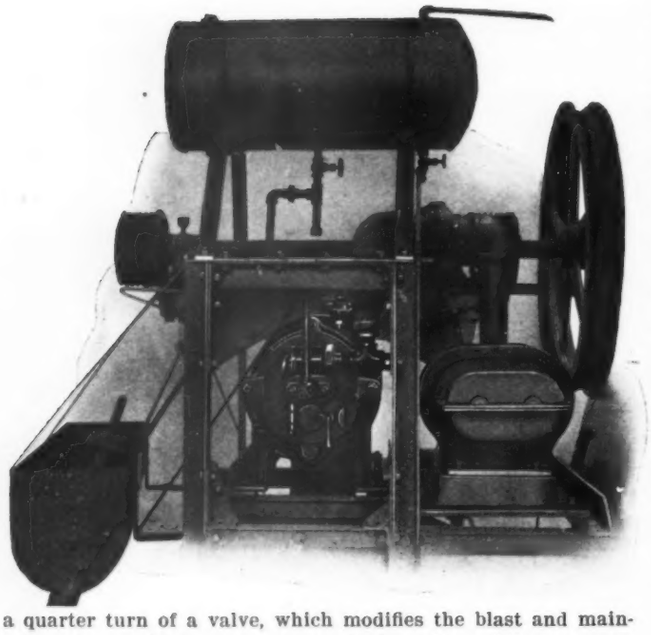
If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will haveprompt attention.

The Barrett Company

New York Chicago Philadelphia Boston St. Louis Cleveland Cincinnati Pittsburgh
Detroit Birmingham Kansas City Minneapolis Nashville Salt Lake City Seattle Peoria

The Paterson Manufacturing Co., Limited: Montreal Toronto Winnipeg
Vancouver St. John, N. B. Halifax, N. S. Sydney, N. S.

TRADE B MARK



a quarter turn of a valve, which modifies the blast and maintains the desired temperature during the mixing process which, with bitumens added, requires only two minutes.

When auxiliary drying plants or ovens are employed partially to take the moisture out of the material, the capacity is greatly increased.

Remelting and Mixing Old Asphalt.

In re-laying and patching asphalt pavement, this type of machine is beyond question an economical and efficient apparatus.

In the first place it eliminates a great amount of double haulage inseparable from the stationary plant. With the Koehring mixer the old asphalt is remelted and remixed as it is ripped from the street. A very small amount of new asphalt is usually added.

The pavement is laid hot from the mixer. The haulage is restricted to a very small amount of new material. From a big item, haulage is reduced to the smallest item. A liberal crew for operation of this unit mixer for this work is composed as follows: One foreman, one man breaking asphalt, four wheelers who also clean concrete sub-base, one man painting base, patching edges and joints with hot asphalt, one mixer operator, three men raking, smoothing and tamping, and operating hand roller.

The No. 22 paver type, as made by the Koehring Machine Co., Milwaukee, is usually used for this asphalt repair work. This mixer is provided with its own traction for moving ahead on the street or for moving from job to job. Remelting and mixing capacity of this mixer, while varying with character of materials, is adequate to keep a full crew as enumerated above constantly busy.

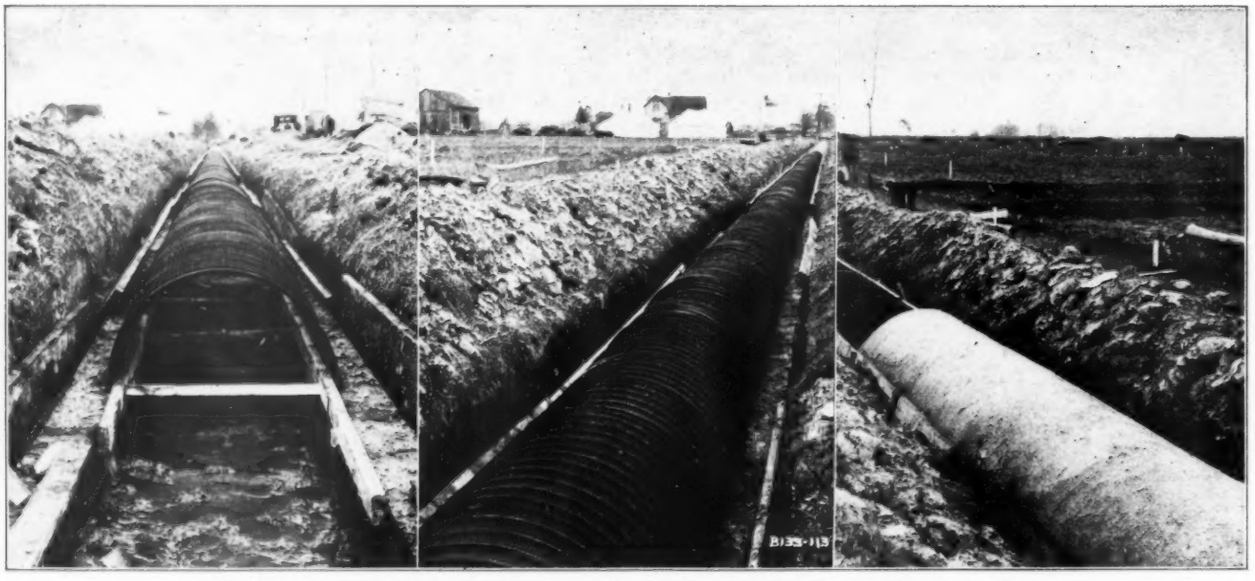
A Storm Water Sewer in Greenfield Township, Wayne County, Michigan

A very interesting construction was adopted in building the storm water sewers in Greenfield township, northwest of Detroit. Probably a mile of these sewers have already been constructed principally in the subdivisions known as West Lawn and Schoolcraft located out Grand River avenue.

The principal feature of the construction was the use of arched Hy-Rib to form the circular tops of the sewers. Before this Hy-Rib was set concrete had been poured forming the invert of the sewer. At either side extending down the length, a small wall 12 inches high was built between forms. This wall was 12 inches wide at the base and 8 inches at the top. The arched Hy-Rib formed a complete semi-circle and was set directly on top of the concrete wall. The Hy-Rib was furnished bent to this exact curve by the Trussed Concrete Steel Company. The concrete was poured directly on top of the arched Hy-Rib to a thickness varying from 6 inches at the center to 8 inches at the sides. No forms of any nature whatever were used in the construction. The work proceeded very rapidly and the Hy-Rib served the double purpose of forms and reinforcement for the concrete.

The diameter of the storm sewers is 3 feet so that the arch has a radius of 18 inches. Photographs give a good idea of the construction of this work.

The contractors for the construction were the Otis Cement Construction Company, Detroit, Mich. Hy-Rib reinforcement was furnished by the Trussed Concrete Steel Company, of Youngstown, Ohio.



HY-RIB ARCHED CONDUIT, SNYDER ROAD, GREENFIELD TOWNSHIP, NEAR DETROIT, MICH.

HY-RIB IN PLACE WITH INSIDE AND OUTSIDE FORMS FOR WALLS.

HY-RIB IN PLACE WITH OUTSIDE FORMS FOR STARTING CONCRETE LAYING ON ARCH.

COMLETED CONCRETE ARCH OF SEWER.

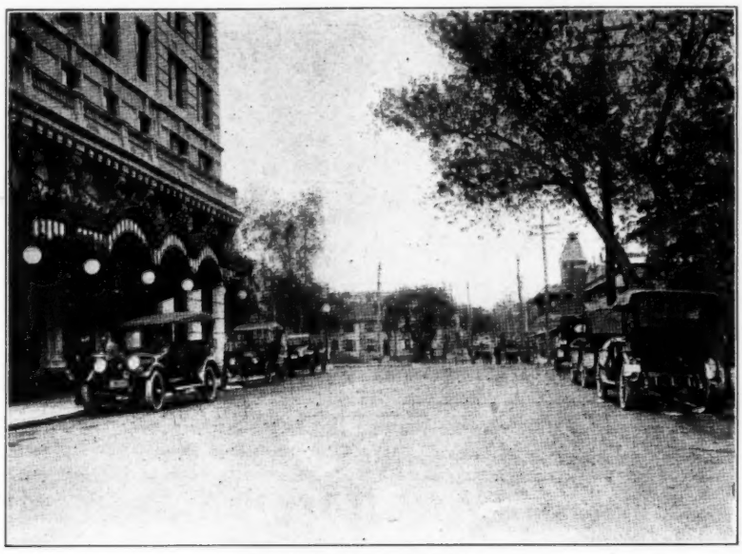
WHAT SHALL THE PAVEMENT BE

?

This question often comes to the minds of taxpayers when paving their street is considered.

Many have stopped and investigated—others go headstrong and with their eyes closed.

It is the duty of all city officials to investigate and obtain for their city's streets the very best construction that can be had; they owe it to the citizens who voted them into office.



WILMINGTON, DELAWARE
Eleventh Street, looking West from Market. Showing Hotel DuPont at left. Bitulithic Pavement laid over Old Brick in 1910. Photograph taken September 15, 1915.

It has been demonstrated many times that **Bitulithic** is the best bituminous construction on the market. It is a pavement made of quality, and every city that has adopted **Bitulithic** can not attest too highly as to its wearing qualities and to its density, sustaining the heavy horse-drawn and motor vehicles.

It is a necessity today to investigate before placing your contracts—cities who wish to save the maintenance expense and have a pavement that has stood the test—

SPECIFY BITULITHIC

Over 400 cities throughout the United States and Canada have laid and contracted for over 40,000,000 square yards of **Bitulithic** roadway 30 feet wide between curbs, which is equivalent to over 2200 miles.

Why not specify BITULITHIC and get the best?

Bitulithic is - Unequalled in reputation.
Bitulithic is - Unquestioned in quality.
Bitulithic is - Unrivalled in popularity.

Pavement of prestige - **BITULITHIC**

Warren Brothers Company

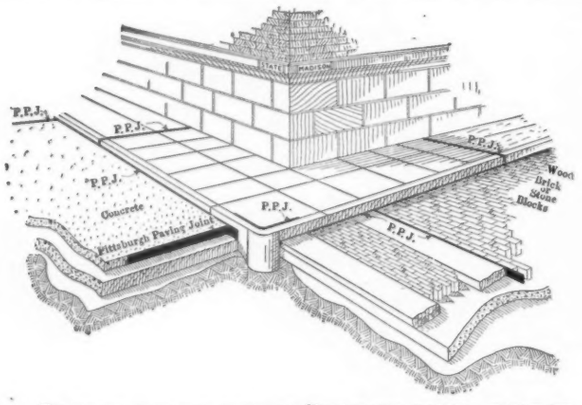
Executive Offices: BOSTON, MASS.

DISTRICT OFFICES:

NEW YORK, N. Y.	CHICAGO, ILL.	ROCHESTER, N. Y.	PORTLAND, ORE.
PHOENIX, ARIZ.	UTICA, N. Y.	LOS ANGELES, CAL.	RICHMOND. VA.
NASHVILLE, TENN.	ST. LOUIS, MO.	TORONTO, ONT.	MONTREAL, P. Q.
	WINNIPEG, MAN.	VANCOUVER, B. C.	

The Pittsburg Paving Joint

We are showing a view illustrating the different uses of the Pittsburgh paving joint and road construction. This joint, which is pre-molded, is all asphalt in construction and is to be had with or without reinforcing. The reinforcing is accomplished by means of a linen mesh embedded in the asphalt.



SHOWING VARIOUS USES OF PITTSBURG PAVING JOINT IN STREET AND ROAD CONSTRUCTION.

This reinforcing is said to give added strength and prevents the possibility of cracking or shattering under unusually severe cold conditions.

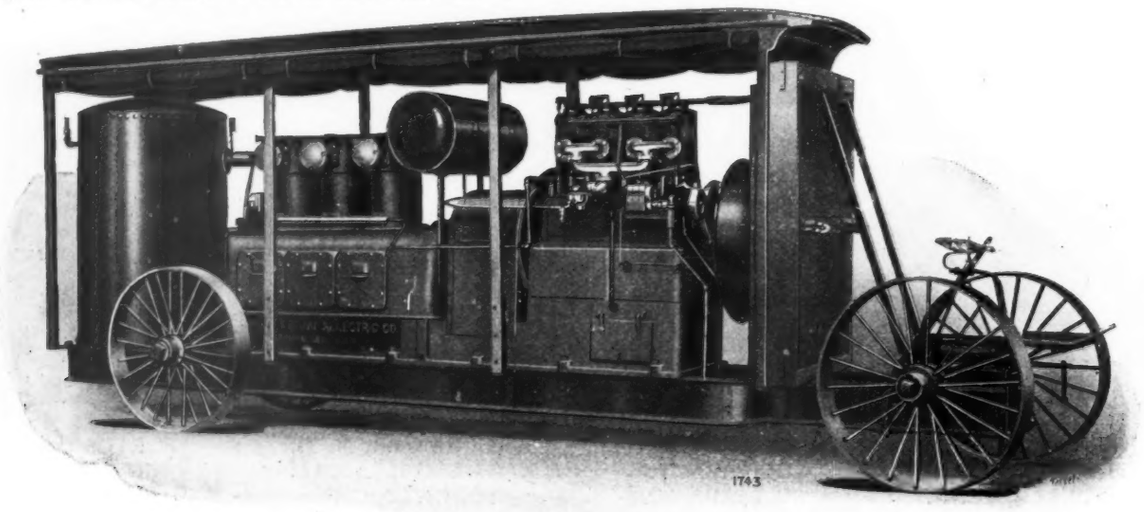
This type of joint, which is handled by Ray D. Lillibridge, Inc., 111 Broadway, N. Y., is made in standard lengths of varying widths and thicknesses to suit the needs of the individual job.

Air Compressor with Motor Drive

The National Brake and Electric Co., Milwaukee, Wis., are marketing a type of portable air compressor with gas motor drive, as illustrated.

This outfit possesses all the advantages of stationary installations and, in addition, eliminates the necessity for extensive piping, as the outfits can be easily moved from place to place and the air applied just where needed. For outdoor service of every nature, including construction and contracting work, these outfits fully meet the demand for self-contained units of power, adapted to a wide range of service.

225-CUBIC FOOT NATIONAL TYPE "3VS" PORTABLE GAS DRIVEN AIR COMPRESSOR WITH CANOPY TOP AND SIDE CURTAINS, AND THERMO-SYPHON SYSTEM OF WATER COOLING.



These outfits, as regards the construction and the method of control, are identical, in every respect, with National stationary installations of the same type. To adapt them for portable service, however, the complete unit, including air compressor and engine, is mounted on an all-steel truck, built especially strong and durable. The frames of the truck are underhung from the axle, as this method of construction permits ready access to the outfit when manipulating same. To facilitate starting of gas engine a clutch of the multiple disc type is mounted on the engine shaft and is operated by a hand lever. By this means the gas motor is disconnected from the compressor while the motor is being started. The gas-driven 3VS compressor is, therefore, as complete a compact self-contained unit of power as the 3VS motor-driven-type compressor.

In order to automatically maintain the air supply within predetermined limits of minimum and maximum pressures, National type 3VS gas-driven compressors are equipped with a National type G pneumatically operated unloading device.

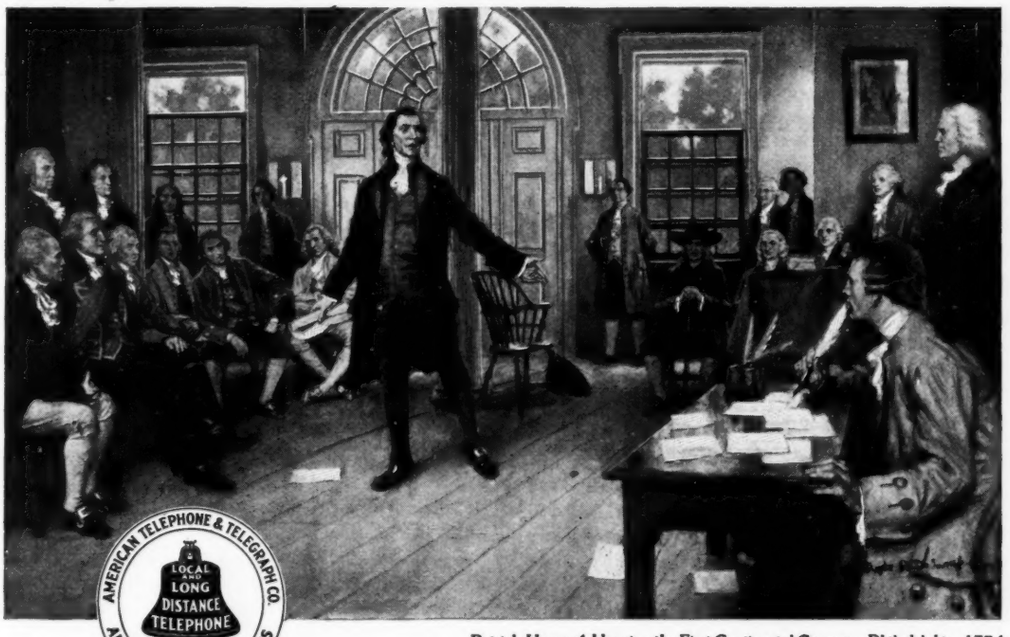
Type G unloader consists essentially of two valves, an admission valve and an exhaust valve, cylinder and piston. The valves are so arranged that each valve performs its function and returns to normal position before the other valve commences operation. A lever, actuated by the piston of the unloader, is also provided.

When the air supply has reached the fixed maximum limit the lever just mentioned causes pins to force the suction valves of the compressor from their seats, which results in the compressor being unloaded. When the air supply has reached the fixed low limit of pressure, the valves are permitted to return to their seats and the compression of air is resumed.

Unloading the compressor reduces the load on the engine. This operation causes the fly-ball governor to restrict the supply of gasoline fed to the engine, so that the increase of speed will not be more than 5 per cent above full-load speed.

New Book on Steel Joists and Studs

The new book on Kahn pressed steel construction is a comprehensive publication on the use of steel joists and studs with Hy-Rib in building construction. It describes an improved type of fireproof floors presenting the advantage of light weight, economy and simplicity of erection. The construction is particularly adapted for stores, apartment houses, schools, hotels and residences. It entirely eliminates the use of wood joists and wood lath, giving permanent construction at a comparatively nominal cost. The catalog shows various types of these floors, including their use with reinforced con-



Patrick Henry Addressing the First Continental Congress, Philadelphia, 1774

One Nation; One People

WHEN Patrick Henry declared that oppression had effaced the boundaries of the several colonies, he voiced the spirit of the First Continental Congress.

In the crisis, the colonies were willing to unite for their common safety, but at that time the people could not immediately act as a whole because it took so long for news to travel from colony to colony.

The early handicaps of distance and delay were greatly reduced and direct communication was established between communities with the coming of the railroads and the telegraph. They connected places. The telephone connects persons irrespective of place. The telephone system has provided the means of individual communication which brings into one national family, so to speak, the whole people.

Country wide in its scope, the Bell System carries the spoken word from person to person anywhere, annihilating both time and distance.

The people have become so absolutely unified by means of the facilities for transportation and communication that in any crisis they can decide as a united people and act simultaneously, wherever the location of the seat of government.

In the early days, the capital was moved from place to place because of sectional rivalry, but today Independence Hall is a symbol of union, revered alike in Philadelphia and the most distant American city.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

AND ASSOCIATED COMPANIES

One Policy *One System* *Universal Service*

crete beams, with structural steel and with masonry walls, giving tables for carrying capacity, tests, etc.

Another portion of the book deals with the use of the construction in partitions and bearing walls. The simple standard connection is brought out clearly, showing how all the members are securely united without the use of any rivets or bolts; only the simple wedge connection. Tables giving carrying capacity of partitions are included; also complete specifications covering floors, partitions, roofs, ceilings, etc.

The back part of the book shows the various standard sections with their properties, weights, etc. The catalog is profusely illustrated with examples of the use of pressed steel construction in important work.

The book is sent free to anyone interested in improved building construction by the Trussed Concrete Steel Co., Youngstown, O.

Blasting a Canal

Recently, Blaster Patterson, of Illinois, was called upon to blast a ditch 1,600 feet long, 4 feet deep, 4 feet wide at the bottom and from 8 to 10 feet wide at the top, to save the members of the club from taking their boats on a long detour of a mile and a half. Mr. Patterson did the work successfully with 1,200 pounds of 60 per cent straight Du Pont dynamite. The canal is straight and clear.

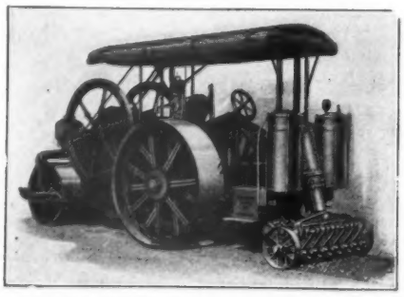
Bitoslag in Allegheny County, Pa.

The board of county commissioners of Allegheny county, Pa., have awarded contract to the Thomas Cronin Company, of Pittsburgh, for 1½ miles of Bitoslag pavement.

It was in McKeesport, Pa., which is in Allegheny county, that Bitoslag was laid originally in 1910. The success of the McKeesport pavement, also the success of Bitoslag pavement laid in Philadelphia last year, under heavy traffic, is causing many communities, especially where slag abounds, to look with favor upon this form of pavement.

The Austin Pneumatic Road Scarifier

Earth, gravel and macadam roads require frequent and extensive repair. To make these repairs economically and efficiently it is necessary to scarify the old surface, and to roll the new material into close union with the old road bed. A combined roller and scarifier suggests itself as a valuable combination, and the Austin Mfg. Co., Chicago, Ill., have made the combination, attaching the scarifying bars to a piston working in a compressed air cylinder supplied with air from



storage tanks mounted on either side of it. The frame carrying the entire apparatus is attached to the rear end of the frame of the road roller. The air pressure in the storage tanks is maintained by an air compressor on top of the engine cylinder, operated from the crankshaft. The accompanying cut gives a view of the machine and will be more satisfactory than a long wordy explanation. A booklet describing and illustrating the combination will be sent on request.

New Cleveland Hose Wagon

The fire department, city of Cleveland, Ohio, has in aperation its new South Bend "Double Duty" hose wagon which is unique in many respects.

Even when running at full speed, in response to an alarm, it is convenient and easy for firemen to pass over the running boards from the rear step to the driver's seat with perfect safety, due to the fact that mudguards on the rear wheels have been turned into step-like platforms on the running boards.

The body is finished in Lincoln Highway red and finely striped in gold leaf. The wheels, which are in natural wood

SOUTH BEND DOUBLE-DUTY HOSE WAGON, AS OPERATED BY FIRE DEPARTMENT OF CLEVELAND, O.

finish, are striped in gold and colors. The platforms, running boards, etc., and battery boxes are covered with one-quarter-inch battleship cork linoleum, bound with heavy strap steel.

This outfit carries, in its equipment, two 6-pound standard fire axes, two standard break-bottle fire extinguishers, 8-foot pike pole, 16-foot extension jack ladder, crowbar, door openers, etc.

The pneumatic tires are 37x5 single in front, 37x5 dual in rear.

The following details of this outfit, as manufactured by the South Bend Motor Car Works, are of interest: H.p., 95; 54.1, S. A. E. rating; motor, Wisconsin; cylinders, six; starter, Lece-Neville; frame, chrome Vanadium pressed steel, heat-treated; body, 100 inches long, 22 inches deep and 47 inches wide; capacity, 1,500 feet triple-jacket fire hose.

Bitulithic Decision in Pennsylvania

In the case of Warren Brothers Company v. W. C. Evans in the U. S. District Court for Eastern Pennsylvania, arising out of the award of two contracts for Filbertine roadway by the State Highway Department to Mr. Evans, Judge Dickinson has decided that the proposed construction would be an infringement of the Warren patent No. 727,505 and has enjoined the construction of the roads.

Trade Notes

The Asbestos Protected Metal Company, of Pittsburgh, announces that hereafter it will be represented in Cincinnati, O., and surrounding territory, by Mr. E. G. Irwin, located in the Union Trust building.

The city of Houston, Tex., E. E. Sands, city engineer, has adopted the Cleveland Dock Engineering Company's design for a marginal dock in Buffalo Bayou. This is a turning basin, and the dock about to be built is Unit No. 4 of ten units.

The J. G. White Engineering Co., New York, have a contract for the construction of a new paper pulp plant of 120 tons daily capacity at Bagotville, Quebec, on HaHa Bay, Saguenay river, for the HaHa Baie Sulphite Co., of Chicoutimi, Que.

The Portland Cement Association is the new name of the re-organized Association of American Portland Cement Manufacturers, with main offices in Chicago and a New York office at 101 Park avenue, in charge of Lewis R. Ferguson.